ATTACHMENT A

Requests by State Agencies for Geospatial Data Produced by Local Government

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Report by the Local Government Committee of The Geographic Information Coordinating Council

August 16, 2006

Background

County and municipal government agencies receive frequent requests for copies of locally produced geospatial data from many different state government agencies. Duplicative requests for data pose a burden on local government agencies with limited staff and computer resources.

At the August 3, 2006 meeting of the Local Government Committee (LGC), LGC members and other local government representatives present described the extent of the problem. Some examples are described below:

- One county reported responding to requests from seven different state agencies in the past year for orthophotography, a data set that is essentially static. The state agencies were:
 - o Department of Transportation
 - o CGIA
 - o DENR (2 other DENR agencies other than CGIA)
 - o Department of Agriculture and Consumer Services
 - o Division of Emergency Management, Department of Crime Control and Public Safety
 - o State Property Office
- Another county received requests from different sections in the same state government department. In one case the request was from a person in the same section to which the county had previously provided the data. In fact, the person making the request worked at a desk adjacent to the person who had previously received the data but claimed that they could not transfer the data between the two computers.
- Another county reported requests for the same data set from the following agencies:
 - o CGIA, for the Floodplain Mapping Program
 - Division of Forestry
 - Wildlife Resources Commission
 - Department of Commerce

These are just a few of the examples that were cited. Each of the local government representatives in attendance at the LGC meeting reported multiple requests from different state agencies. Each of the departments cited above were mentioned more than once.

In addition, counties receive data requests from other organizations with ties to state government that add another dimension to the problem. For example:

• One municipality reported that frequent requests from students at North Carolina State University are a growing problem.

• Several in attendance noted that similar requests for data come from lead regional organizations. One person noted that a letter from a COG requesting data stated that the COG had been "designated by the state as a Regional Data Center for spatial data." It was not clear which state government agency had designated this particular COG to manage data or for what purpose.

The geospatial data sets most frequently requested from local governments are:

- Aerial imagery (orthophotography)
- Street centerlines
- Property boundaries (cadastral data)
- Zoning boundaries
- Jurisdictional boundaries

Problem

Local government representatives expressed frustration with the lack of communication among state government agencies. Problems persisted even when state agencies were informed that the data had been provided to another state agency. Either the state agency making the request did not want to request the data from the other state agency that had acquired the data or the state agency with the data did not want to redistribute the data.

The LGC members and other local government representatives present at the LGC meeting acknowledge that the issues are complicated and that inconsistent policies at the local government level contribute to the problem.

Some of the issues that contribute to the problem are described in the following section:

Issues

<u>Redistribution</u> – The issue of redistributing data, once acquired by a state agency, is one complicating factor. Local government polices vary considerably. Some local governments:

- Permit unrestricted redistribution of their data to any other organization.
- Permit redistribution of their data to other state and federal agencies but not to the private sector.
- Do not allow redistribution of their data to any other organization.
- Require a signed agreement covering the conditions of use and redistribution, which in some case must be approved by elected officials.
- Require an official letter of request that states the intended use of the data;
- Have different policies for one data set than for another data set.

State government agencies also have different policies for redistributing data that were acquired from local governments. Some state departments do not want to be responsible for redistributing data to other state agencies. Conversely, at least one state department has a policy in place that requires that they share any data that they possess, even if the local government that provided the data does not allow redistribution.

<u>Data Currency</u> – Local governments acknowledge that, for data sets that are updated on a regular basis, users may need the most current version of the data. To reduce the frequency of requests for these data sets, some local governments support a download capability by posting the data on an FTP site. Others may supply data on a CD for a fee. The fees are usually, but not always, nominal. Data provided on CD represent a snapshot in time and may only be updated on a quarterly or semi-annual basis. Agencies that do not support a download capability or that have more restrictive distribution policies are likely to receive more frequent data requests.

<u>Space Limitations</u> – Most vector data set files are small enough to be easily distributed over a network. The same is not true of raster files, particularly aerial photography. This data set poses the most difficult problems. Issues include:

- Uncompressed aerial imagery cannot be easily distributed over a network. The time required to transfer aerial imagery for a county may be hours and transmission failure is common.
- Transfer of aerial imagery is typically by DVD or portable hard drive. For large counties, as many as 90 DVDs may be required to store uncompressed data and the time to load the data can run into many hours. Portable hard drives offer a simpler solution but are bulky, expensive to ship and must be returned by the data recipient.
- Compressed aerial imagery requires significantly less storage space but is not suitable for all applications. Some state agencies need the uncompressed TIF files.
- Currently no single state government agency has the capacity to store aerial imagery for all or even most of the counties in North Carolina. State agencies that acquire aerial imagery from counties cannot easily store and redistribute the data to other state or federal agencies.
- Some counties, even those that provide their vector data through a download capability, simply do not fulfill requests for aerial imagery due to the burden on staff and computer resources. Instead, counties may refer these requests to the photogrammetry contractor that acquired the imagery. The contractor, under a contract with the county, is authorized to provide the imagery on a portable hard drive at a fee, which can be as much as \$800.

<u>Documentation</u> – The lack of compliant metadata for many data sets complicates the problem and may lead to frequent follow-up phone calls from agencies that acquired the data, either directly or from a secondary distributor. In some cases, agencies are reluctant to serve as either the primary distributor or a secondary distributor of data for which metadata is unavailable.

<u>Formal Agreements</u> – Are formal memoranda of agreement required to define the obligations of the agencies involved in data sharing? Or are there general public access policies that include language that define or address the obligations and commitments of the agencies sharing data?

Summary and Recommendations

Initially, the LGC focused on a single recommendation – that the State designate a single state agency to serve as a clearinghouse for all data requests by state government agencies to local governments.

However, in recognition that the issues are complicated and that the problems cut across both state and local government agencies, the LGC recognizes that the solution is not quite so simple. A mix of policy, process and technology solutions will be required to solve the problem. There may be different solutions or strategies for different data themes.

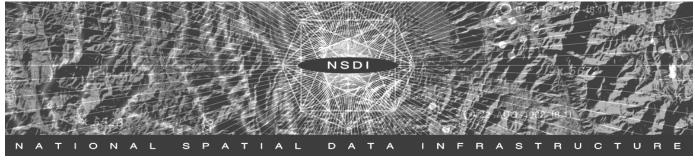
The LGC recommends that the Council direct the Statewide Mapping Advisory Committee (SMAC) or a special subcommittee under the direction of the SMAC to study the problem and develop specific recommendations that address the concerns of state, federal and local government agencies. If a special subcommittee if formed, it must include representatives from local government appointed by the LGC.

The SMAC should consider the following:

- 1. The vision and characteristics of NC OneMap. The vision of NC OneMap addresses many of the concerns raised by the LGC. The LGC believes that the policies, processes and technologies adopted by the Council to address the issue of data sharing must be grounded in the NC OneMap principles and represent best practices that can be adopted by participants of NC OneMap.
- 2. The activities of the Working Group for Roads and Transportation (WGRT). The WGRT is a subcommittee of the SMAC that is addressing many of the problems described herein but for a single data theme roads. The work of the WGRT is in essence a microcosm of the larger issue of data sharing and the conclusions and recommendations of the WGRT may be applicable.
- 3. The activities of the SMAC's Orthophoto Planning Group. The Orthophoto Planning Group is a long standing subcommittee of the SMAC that addresses issues related to orthophotography. At its July meeting, the SMAC asked the Orthophoto Planning Group to address problems related to sharing aerial imagery, primarily among state agencies in the Raleigh area. Again, as with the activities of the WGRT, the activities of the Orthophoto Planning Group will likely focus on many of the same problems that concern the LGC.
- 4. The potential role of Ramona, the geographic data on-line inventory tool that was released by the Council this spring. Perhaps Ramona can be used to track data developed by local government and subsequently shared with other agencies.
- 5. The activities of the Library of Congress partnership between NC State University Library and CGIA. This project, which focuses on archival and preservation of geospatial data, may provide insights that are applicable to the data sharing problem.

ATTACHMENT B

Guidelines for Providing Appropriate Access to Geospatial Data in Response to Security Concerns



Guidelines for Providing Appropriate Access to Geospatial Data in Response to Security Concerns

What is the purpose of the guidelines?

Many public, private, and non-profit organizations originate and publicly disseminate geospatial data. Dissemination is essential to the missions of many organizations and the majority of these data are appropriate for public release. However, a small portion of these data could pose risks to security and may therefore require safeguarding. Although there is not much publicly available geospatial information that is sensitive (Baker and others, 2004, page 123), managers of geospatial information have safeguarded information using different decision procedures and criteria.

The guidelines provide standard procedures to:

- 1. Identify sensitive information content of geospatial data that pose a risk to security.
- 2. Review decisions about sensitive information content during reassessments of safeguards on geospatial data.

Additionally, the guidelines provide a method for balancing security risks and the benefits of geospatial data dissemination. If safeguarding is justified, the guidelines help organizations select appropriate risk-based safeguards that provide access to geospatial data and still protect sensitive information content.

The guidelines do not grant any new authority and are to be carried out within existing authorities available to organizations. They apply to geospatial data irrespective of the means of data access or delivery method, or the format.

How are the guidelines organized?

The guidelines provide a procedure consisting of a sequence of decisions (see Figure 1) that an originating organization should make about geospatial data. Each decision is accompanied by related instructions and discussion.

The decision sequence is organized using the following rationale:

- I. Do the geospatial data originate in the organization? If not, the organization is instructed to follow the instructions related to safeguarding that accompany the data.
- II. If the geospatial data originate in the organization, do the data need to be safeguarded? This decision is based on three factors:
 - Risk to security: Are the data useful for selecting one or more specific potential targets, and/or for planning and executing an attack on a potential target?
 - Uniqueness of information: If the data contain information that pose a security risk, is this sensitive information difficult to observe and not available from open sources?
 - Net benefit of disseminating data: If the sensitive information poses a risk to security and is unique to the geospatial data, do the security costs of disseminating the data outweigh the societal benefits of data dissemination?

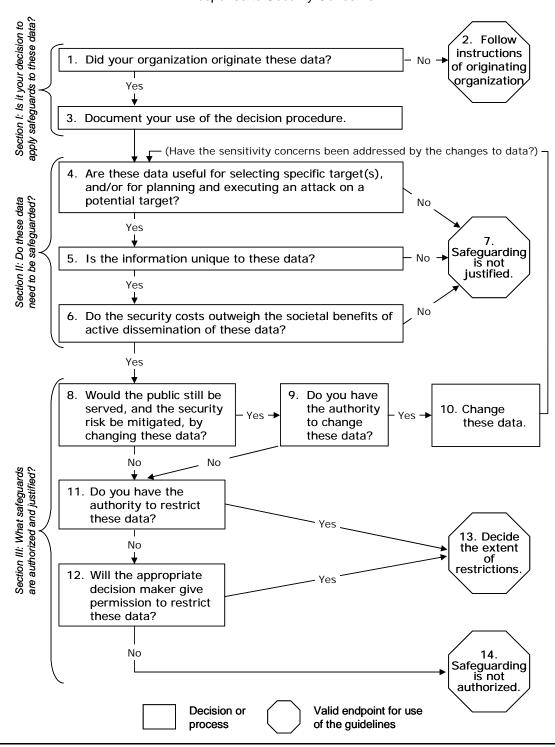
Safeguarding is justified only for data that contain sensitive information, that are the unique source of the sensitive information, and for which the security risk outweighs the societal benefit of dissemination.

- III. If the data need to be safeguarded, what safeguards are justified? The guidelines offer two options:
 - Change the data: Change the data to remove or modify the sensitive information and then make the changed data available without further safeguards. Organizations are advised to review the changed data to ensure that the change(s) dealt effectively with the security concern.

FEDERAL GEOGRAPHIC DATA COMMITTEE PHONE: 703-648-5514 U.S. GEOLOGICAL SURVEY, 590 NATIONAL CENTER FAX: 703-648-5755 RESTON, VIRGINIA 20192 EMAIL: fgdc@fgdc.gov Restrict the data: Establish restrictions, commensurate with the assessed risk, on access to, use of, or redistribution of the data.

In both cases, organizations are advised to ensure that they have the authority to safeguard the data. If they do not have the authority, they may seek it from an appropriate decision maker. The decision maker may provide the authority to safeguard the data, overrule the conclusion that the data require safeguarding, or find that there are no legal means to safeguard the data.

Figure 1. Decision Tree for Providing Appropriate Access to Geospatial Data in Response to Security Concerns



Why were the guidelines developed?

Geospatial data play a vital role in the United States. They underpin one-half of the Nation's domestic economic activities (National Academy of Public Administration, 1998, page 11), aid our international competitiveness, support a large array of Federal, state, local, and tribal government activities, and serve the general public.

In the United States many public and private organizations and individuals originate geospatial data and make them available to the public. Because of this condition centralized control of information is not viable and decision making about the sensitivity and safeguarding of geospatial data will be decentralized.

Although there is not much publicly available geospatial information that is sensitive, organizations have safeguarded geospatial information based on the use of differing procedures and criteria. Some organizations have curtailed access without assessing the risk to security, the significance of consequences associated with improper use of the data, or the public benefits for which the data were originally made available. Contradictory decisions and actions by different organizations easily can negate each organization's actions.

Guidelines for identifying sensitive data, determining risks associated with them, and assessing their benefits help the geospatial data community in several ways. They help organizations take appropriate actions by evaluating the sensitive content in the context of other available information, the benefits lost by restricting data access. and the options for safeguarding data. Use of guidelines can frame discussions about the importance of making data publicly accessible and encourage the development of consensus decisions. Use of a common, standardized approach to the identification of geospatial data that have sensitive content and to the appropriate safeguarding of such information will increase the consistency among individual organization's actions. The guidelines help organizations decide on reasonable access to sensitive data and avoid unnecessary safeguards that unduly restrict public access to geospatial data.

On what premises are the guidelines based?

The guidelines strike a balance among these principles:

 Provide appropriate safeguarding for information that could potentially be used to inflict significant harmful consequences to public safety or security of property.

- Provide for the free flow of information between the government and the public essential to a democratic society. This flow of information enables both informed public participation in decision-making and private reuse of government information. It is also essential to minimizing the burden of government paperwork on the public, minimizing the cost of government information activities, and maximizing the usefulness of government information.
- Recognize that geospatial data often have value to organizations other than the organization that originates the data. The fundamental tenet of the National Spatial Data Infrastructure to "build once and share or use many times" should be supported to the maximum feasible extent.
- Continue the benefits that accessible geospatial data provide to the Nation's economic and scientific enterprises.
- Provide and continue public access to information needed to implement and enforce laws and regulations for the protection of public health and safety and the environment, land management, and other public purposes.
- Enable the sharing of information among organizations as needed to allow them to accomplish their missions and goals.
- Promote the economical management and maintenance of government information and avoid duplication.

These principles are drawn from relevant policies, including Federal and state laws and related implementation instructions regarding freedom of information and public records; information management; the public's right to participate in government policy development and decision making; the public's right to review information used in government decision making; the public's "right to know"; protection of sensitive information for national security and homeland security reasons; prohibition of transactions with persons who commit, threaten to commit, or support terrorism; and government depository libraries. Appendix 1 contains a sample list of these policies. Analyses from the RAND Corporation report "Mapping the Risks: Assessing the Homeland Security Implications of Publicly Available Geospatial Information" (Baker and others, 2004) were considered in developing the guidelines. Work by the

National States Geographic Information Council (National States Geographic Information Council, 2002) provided the basis for the decision-making approach used in the guidelines.

To whom are the guidelines directed?

The guidelines are directed at organizations that originate geospatial data and are interested in disseminating data publicly, but are concerned that such actions may pose a risk to security. Persons using the guidelines should be knowledgeable about their organization's authorities, policies, and decision making processes related to data access; the potential security risks posed by dissemination of the geospatial data; the benefits that users receive from the organization's data and the impacts of changes to data access on these users; and the ability to evaluate the information content and utility of geospatial data and compare them to other sources of information. Decisions must also be made with full knowledge and participation on the part of the executive management of the organization.

If the originating organization is uncertain about the potential security consequences of disseminating geospatial data, it should seek advice from others including legal counsel, security organizations, and facility operators. Law enforcement and emergency management agencies experienced in homeland security matters are sources of advice on the likelihood of an attack scenario and the potential consequences of such an event. Remember, however, that such advice may tend to overestimate the security risks posed by geospatial data and is unlikely to include consideration of the broad range of alternate information sources available from the geospatial and other communities. For those reasons, care should be taken to familiarize advisors with the current state of geospatial data uses and availability so that the originating organization receives practical and useful advice. That said, the responsibility for making decisions about safeguarding ultimately rests with the originating organization.

Assessments of risks and costs must also be balanced with a full understanding of the benefits of data dissemination. Originating organizations should seek advice from the known or potential users regarding the benefits of the information. Keep in mind that benefits are often highly decentralized. Benefits to geospatial data users outside the originating organization (secondary users) can be greater than those to users within the originating organization (primary users). Outside (secondary) users may receive data directly from originating organizations or indirectly

through intermediaries such as libraries or companies that repackage or add value to data.

What terms are used in the guidelines?

- authority permission; the power to act that is officially or formally granted.
- change to make different in some particular aspect; to undergo a loss or modification. For the guidelines, the idea of "changing" geospatial data (see Steps 8 through 10) includes removing sensitive information and reducing the sensitivity by generalizing the data (that is, reducing the level of detail).
- choke point a strategic narrow route providing passage through or to another region; a strategic point in a transportation, transmission, or communication route which limits movement of traffic, commodities, or information to areas and regions beyond it.
- disinformation misinformation that is deliberately disseminated in order to influence or confuse adversaries.
- geospatial data data that identify the geographic location and characteristics (attributes) of natural or constructed features and boundaries on the earth. These data may be derived from, among other things, remote sensing, mapping, and surveying technologies.
- metadata data about data; data that describe the content, quality, condition, and other characteristics of data.
- open-source information publicly available information (that is, information that any member of the public could lawfully obtain by request or observation), as well as other unclassified information that has limited public distribution or access (including information from companies, academia, and other sources). Access to such information may or may not require payment. Examples of open-source information include all types of media, government reports and other documents, scientific research and reports, commercial vendors of information, and the Internet.
- opportunity cost the benefit foregone from not using a good or resource (geospatial data in the case of the guidelines) in its best use.
- originating organization an organization or individual that develops or sponsors the development of geospatial data.

redact – to prepare for publication or presentation by removing information and indicating that it was removed.

restrict - to limit access to, use of, or redistribution of data.

safeguard – an activity intended to protect by preventing something from happening; a process, procedure, technique, or feature intended to mitigate the effects of risk. As a verb, to provide a safeguard for.

What concerns are not addressed by the guidelines?

<u>Internal procedures for protecting data</u>: The guidelines assume that organizations already have procedures for handling sensitive data internally. These procedures would include the handling of data by the organization's agents, such as contractors.

Ability to implement the guidelines: The guidelines assume that organizations have executive and management officials who have the authority to take the actions recommended in the guidelines, mechanisms to coordinate with other organizations so as to jointly act in safeguarding data identified as being sensitive, and methods to coordinate outside requests for data among appropriate parties within the organization. The guidelines do not address internal procedures needed to carry out the guidelines, the costs of implementing the guidelines, or ways to fund such costs.

Enforcement of restrictions on "downstream" users: The legitimate sharing of sensitive data raises questions about chains of control and the ability to enforce an originator's restrictions and any subsequent changes thereto on "downstream" users. Other than urging them to respect the restrictions assigned by originating organizations, the guidelines do not directly identify the responsibilities of organizations that receive or add value to data, or of intermediaries such as libraries, distributors, and other information brokers.

Review of decisions in response to changing environments: Decisions made about the sensitivity of geospatial data and the safeguards that are appropriate for sensitive data will inevitably change over time. Reasons include better understanding of security risks, changes in the value of geospatial data through time, and changes in competing means of gathering information. Reviews of decisions can result in a decrease, an increase, or no change in access. Altering the access to geospatial data affects not only the originating organization, but also "downstream" organizations.

Decisions about the sensitivity of derived geospatial data: Derived geospatial data, which are developed by combining or querying one or more data sets, present special challenges, especially if the source data are sensitive. Such derived works may or may not be sensitive. In addition to using the guidelines to evaluate the derived data set, organizations that develop derived data sets should contact the originators of sensitive source data to determine whether the derived data are also sensitive.

Appeals of an originating organization's decisions: Organizations should only use the guidelines to make decisions that are permitted by existing authorities. Appeals about such decisions are therefore made using procedures available under the authority cited by the originating organization.

Under what authority are the guidelines issued?

The Federal Geographic Data Committee issues the guidelines under the authority provided by U.S. Office of Management and Budget Circular A-16 to establish procedures necessary and sufficient to carry out interagency coordination and to implement the National Spatial Data Infrastructure.

When will the guidelines be reviewed, and when will they expire?

The Federal Geographic Data Committee will review these guidelines no later than five years after the date of approval. Factors to be considered include changes in security risks and the business practices of the geospatial data community, and an assessment of the degree to which the guidelines have accomplished their purpose.

The guidelines expire when superseded or when withdrawn by the Federal Geographic Data Committee.

Decision Procedure

The decision procedure is provided in the form of a decision tree (see Figure 1) and the following related instructions and discussion.

Note that the procedure has been followed correctly only when you reach one of the following: Step 2, Step 7, Step 13, or Step 14.

Section I: Is it your decision to apply safeguards to these data?

Step 1 – Did your organization originate these data?

If the answer to the question is no go to Step 2. If the answer is yes go to Step 3.

Discussion: If your organization did not originate the geospatial data you should not make decisions about safeguarding the data.

Step 2 – Follow instructions of the originating organization.

When you reach this step your use of the decision procedure is complete.

Discussion: You should honor any instructions that accompany the data. If no instructions accompany the data, you may presume that no restrictions apply to the data. Instructions, terms, and conditions may be found in the accompanying metadata and/or in licenses, signed agreements (including non-disclosure agreements), or other instruments that accompany the data. You are responsible for knowing and honoring restrictions that accompany the data.

Step 3 – Document your use of the decision procedure.

As you follow the decision procedure, organize and document your decisions. The documentation should include the identification of the geospatial data, the potential security concerns, findings determined by use of the guidelines, the actions taken, and (if needed) the authority or case law that supports the actions taken. This information should be available to organizations that receive the data. Appendix 2 identifies elements in the "Content Standard for Digital Geospatial Metadata" (Federal Geographic Data Committee, 1998) that are available for documenting the use of the guidelines in the metadata. Go to Step 4.

Discussion: Organizations will find it useful to document their actions so that they are positioned to review the

consistency of their decisions, recall their reasoning when reviewing a decision, and explain a decision if challenged. Organizations also should describe decisions and actions to organizations that receive the data.

Section II: Do these data need to be safeguarded?

Overview: This section provides guidelines to decide if the geospatial data need safeguards.

Step 4 – Are these data useful for selecting specific target(s), and/or for planning and executing an attack on a potential target?

Does knowledge of the location and purpose of a feature, as described by the data, have the potential to significantly compromise the security of persons, property, or systems? For example, do the data:

- Provide accurate coordinates for facilities that are not otherwise available and not visible from public locations?
- Provide insights on choke points, which, if used to plan an attack, would increase its effectiveness?
- Aid the choice of a particular mode of attack by helping an adversary analyze a feature to find the best way to cause catastrophic failure?
- Provide relevant current (real-time, near real-time, or very recent) security-related data that are not otherwise available?

Do the data identify specific features that render a potential target more vulnerable to attack? For example, do the data:

- Identify internal features that are critical to the operation of a facility such as spent fuel storage at a nuclear reactor or the location of unsecured valve bodies on a major pipeline?
- Provide details on facility layout and vulnerabilities such as the location of security personnel or storage areas for hazardous materials?
- Provide insights into operational practices such as shift changes or patrol areas for security personnel or the times that sensitive operations are performed?
- Provide relevant current (real-time, near real-time, or very recent) vulnerability-related data that are not otherwise available?

If the answer to BOTH parts of the question is no, then safeguarding is not justified and you should go to Step 7. If the answer to EITHER part is yes, go to Step 5.

Discussion: In effect, this step performs a "user needs assessment" in which the "user" is an adversary. You are asked to evaluate two aspects of the data. First, do the data provide information about the location and nature of facilities or features that would allow an adversary to select critical targets? Second, do the data provide information that is helpful in executing an attack and/or maximizing the resulting damage because they offer intimate knowledge of a facility, its characteristics, or its operations?

Sensitive information does not include the fact of existence of a facility at a particular place or the general layout of a facility. Concern centers on data that provide very specific and timely information. Such security-related data include information about the relative importance of a feature to a larger system or other systems; the timing of activities; communication capabilities; detailed business and industrial processes; architectural and engineering plans; previously identified vulnerabilities and relationships to, or interdependencies with, larger or other systems; measures and plans for securing and protecting facilities; and measures and plans for responding to attacks or damage. In many cases, the attribute component of geospatial data is more likely to be sensitive than is the location component.

Care should be taken not to automatically assume that the high cost or accuracy of data means that the data have high value to an adversary. Depending on the mode or intended outcome of an attack or on what other information is available, relatively low cost, low accuracy, or historical data may be satisfactory for an adversary's purpose.

Examples:

- Regarding knowledge that aids selection of a target:
 Does an attribute table provide a detailed inventory
 of hazardous material in a facility? Very current
 information (for example, a daily inventory) would
 be of much greater concern than would be summary
 information (for example, a yearly average).
- Regarding specific features that render a potential target vulnerable: Do the data locate and identify operational procedures at facilities, floor plans showing exact storage locations, or information about the security measures in place at a facility?

Step 5 – Is the information unique to these data?

In particular is the information that appears to be sensitive based on the evaluation in Step 4:

- Difficult to observe?
- Not found in other open-source geospatial data (for example, is the feature not found elsewhere in other digital or hard copy maps)?
- Not found in other open-source publications (for example, telephone books and Internet directories)?
- Not available from open-source engineering or technical sources?
- Not available from open-source libraries, archives, or other information repositories?

If the sensitive information is readily observable or available from open sources safeguarding is not justified and you go to Step 7. If the geospatial data under evaluation provide unique information that cannot be obtained from observation or open sources, you go to Step 6.

Discussion: This step addresses the likelihood that actions you take to safeguard information will be effective. If information encoded by data that appears to be sensitive (based on the evaluation in Step 4) is readily available from observation or open sources, efforts to safeguard the information are unlikely to reduce vulnerabilities or be effective.

Remember that the goal is to identify information that is unique, not just geospatial data that are unique. Your data may be the only "geospatial" source of an item of information, but other publications and media may disclose the same information.

Consider relevant historical data in addition to contemporary data. A facility constructed thirty years ago not only is described in new data, but also in data, maps, imagery, and other sources compiled and disseminated during the previous thirty years.

Decisions to safeguard data are only effective when all parties that have similar information choose the same action. In the case of organizations that originate similar information through independent actions, consultation among the organizations about appropriate safeguarding would increase the effectiveness their actions.

Examples:

- Data that show the layout of a publicly observable facility (for example, a bridge, radio tower, water tower, or national monument) may be considered sensitive upon initial evaluation. However, experts generally agree that adversaries visit their intended targets in person and they would, therefore, be able to easily observe the layout.
- A government agency may initially think that the location of a police station should be withheld from an Internet mapping system. However, the locations of such facilities must be widely known for them to effectively serve the public. They can be easily found by looking in telephone directories or by driving past the site.

Step 6 – Do the security costs outweigh the societal benefits of active dissemination of these data?

In particular would the sensitive information cause security costs such as:

- A significant increase in the likelihood of an attack?
- A significant decrease in the difficulty of executing an attack?
- A significant increase in the damage caused by an attack?

If so, do the anticipated security costs outweigh the anticipated societal benefits of active data dissemination such as:

- Business or personal productivity resulting from continued or increasing use of the geospatial data?
- Continued or increasing effectiveness of public health and safety or the regulatory functions of government?
- Continued or increasing support of legal rights (for example, "right to know") and public involvement in decision-making?
- Continued or increasing support to those who depend on public information in absence of an alternate data source of equal quality at the same cost?

After such consideration go to Step 7 if you believe that the benefit of providing open access to the data outweighs the potential security costs, or to Step 8 if the security costs outweigh the value of providing open access. Discussion: Originating organizations should make every effort to learn about the laws and regulations that affect dissemination of their data and should carefully consider the magnitude of the security risk incurred versus the benefits that accrue from the dissemination of any particular data. The benefits should be evaluated using quantitative and qualitative measures. Included among the societal benefits should be opportunity costs caused by the reduced availability of data resulting from safeguarding.

A great deal of our Nation's success can be attributed to its openness. Access to information has always been readily available to the American public and they recognize that some risk is acceptable. Many laws have been enacted that require public disclosure of seemingly sensitive information. However, some data can be misused with potentially disastrous consequences. Safeguarding of such data therefore warrants consideration.

Examples:

- Geospatial data for hazardous material facilities may be available to the public in response to "right to know" laws. Geospatial data that record the fact that one facility stores 50,000 pounds of a hazardous chemical while another stores only 20 pounds may help an adversary select as a target the facility that stores the larger amount. On the other hand, a citizen may be more concerned about living next to 50,000 pounds of the chemical than 20 pounds, and so the amount would be important information required to comply with "right to know" laws. Is it necessary to provide the detailed attribute information to comply with "right to know" legislation for such facilities, or does informing the public of the presence of the hazardous chemical, but not the quantity, provide sufficient information?
- Geospatial data may locate and identify operational procedures at facilities, floor plans showing precise storage locations, or information about the security measures for a facility. Does the public have the right to access the floor plan of a facility that shows the location and nature of its security systems or the exact storage areas for hazardous materials? Or should this information be restricted to the fire and law enforcement agencies that would respond in the event of an emergency?

Step 7 – Safeguarding is not justified.

When you reach this step your use of the guidelines is complete. Retain your documentation of the decision for future use. Provide information about the evaluation in the metadata and/or in licenses, signed agreements (including non-disclosure agreements), or other instruments that accompany the data. As noted in Step 3, the documentation should include the identification of the geospatial data, the potential security concerns, findings determined by use of the guidelines, the actions taken, and (if needed) the authority or case law that supports the actions taken. Appendix 2 identifies elements in the "Content Standard for Digital Geospatial Metadata" (Federal Geographic Data Committee, 1998) that are available for documenting the use of the guidelines in metadata.

Discussion: Safeguarding is justified only for data that contain sensitive information, that are the unique source of this sensitive information, and for which the security risk outweighs the societal benefit of dissemination. If you reach this step you have decided that your geospatial data fail one of these criteria and so safeguarding is not justified.

Section III: What safeguards are authorized and justified?

Overview: If you reach this section, you have concluded that your geospatial data has sensitive information content that, in its present form, should be safeguarded.

This section provides guidance on appropriate choices for safeguarding data. It encourages maximum possible access to data, and so emphasizes use of the minimum safeguards required to prevent access by a potential adversary. It also challenges the originating organization to be sure that it has the authority to undertake the planned safeguards.

Note that the need to safeguard data should be anticipated as early as possible in a project. In the case of projects undertaken by multiple participants, discussions and decisions should involve all participants. To ensure the effective safeguarding it may be prudent to implement safeguards while the data are being developed in an organization's offices, in the field, or in a contractor's facilities before the originating organization formally takes possession of the data.

Step 8 – Would the public still be served, and the security risk be mitigated, by changing these data?

If you believe that the sensitive information in the geospatial data can be changed to minimize the security risk, and that the changed data still will have public value, go to Step 9. If the data cannot be changed to make the security risk acceptable, go to Step 11.

Discussion: The first type of safeguard is to change the geospatial data. You may find that the geospatial data contain sensitive information that needs to be safeguarded, but that by changing the data they would still useful and could be made publicly accessible.

This decision starts with your organization determining whether it has the authority to change the data. The idea of changing geospatial data includes redaction or removal of sensitive information and/or reducing the sensitivity of information by simplification, classification, aggregation, statistical summarization, or other information reduction methods.

Step 9 – Do you have the authority to change these data?

If the authority to change data exists go to Step 10. If such authority does not exist that course of action is closed and you go to Step 11.

Discussion: At this step, you must decide if your organization has the authority to change the data. Laws, regulations, policies, or concerns about liability may compel the organization to maintain and release data in its original (unchanged) state. Rarely do organizations have policies that instruct them to change data provided for public use. If you are unsure of your organization's authority or policy, seek a policy decision from appropriate executive managers or legal counsel in your organization.

Step 10 – Change these data.

Apply changes that remove or mitigate the security risk posed by the sensitive information. Such changes should be documented in the metadata. As noted in Step 3, the documentation should include the identification of the geospatial data, the potential security concerns, findings determined by use of the guidelines, the actions taken, and (if needed) the authority or case law that supports the actions taken. Appendix 2 identifies elements in the "Content Standard for Digital Geospatial Metadata" (Federal Geographic Data Committee, 1998) that are available for documenting the use of the guidelines in metadata.

When the changes are complete, ensure that the changes actually have mitigated the security risk by reviewing the changed data using the criteria in Section II beginning with Step 4. The changed data are cleared for dissemination when Step 7 is reached. Note that the originating organization must also safeguard the unchanged data if they are retained.

Discussion: At this point you have determined that your organization has the authority to change the data. Change the data and document the changes using the metadata. Do not place disinformation in geospatial data.

An originating organization that changes data should have written procedures and policies describing the types of changes allowed and the conditions under which they are permitted. The originating organization should document, or at least characterize, the changes in the metadata and/or in any licenses, agreements (including nondisclosure agreements), or other instruments that accompany the data. Such documentation should cite the authority or other basis that permits changing of the data.

Examples: The following examples are provided for illustrative purposes only:

- Very high-resolution orthophotography (with pixels smaller than one foot, for example) may provide too much detail about air handling or security systems at a sensitive facility. Possible changes that would mitigate this concern include generalizing the data to a lower resolution, eliminating pixels, or applying an algorithm that reduces the sharpness of the image over the features of concern. Of course, visible differences in the image resulting from these changes may draw attention to the sensitive areas.
- Geospatial data for hazardous material storage facilities include detailed, current, and frequently updated information about the quantity of Class A poisons or explosives that could be used to harm the public, along with information on the names, home addresses, and telephone numbers of management and security personnel. Possible changes to the data include summarizing information about the quantities and removing data fields about personnel from the version of the geospatial data provided for open access.
- The point features in geospatial data provide precise coordinates that allow "discovery" and targeting of sensitive features. Possible modifications to the data include converting the point locations to polygons of random size and shape or reducing the precision of the points by systematic or random changes to the point locations.

Step 11 – Do you have the authority to restrict these data?

If the authority to restrict the data does not exist, you may elect to appeal to an executive manager and/or legal

counsel authorized to grant the required permission (go to Step 12). If your organization has the authority to restrict data go to Step 13.

Discussion: The second, and last, type of safeguard is to restrict access to, uses of, and/or redistribution of the data. At this step, you must decide if your organization has the authority to restrict the data. Some organizations have laws, regulations, policies, or concerns about liability that compel them to release data. Others have clear authority to restrict data. If you are unsure of your organization's authority or policy, seek a policy decision from appropriate executive managers or legal counsel in your organization.

Step 12 – Will the appropriate decision maker give permission to restrict these data?

If the authorized executive manager and/or legal counsel grants permission to restrict the data go to Step 13. If not, go to Step 14.

Step 13 – Decide the extent of restrictions.

The originating organization decides the conditions under which the geospatial data can be accessed, used, and/or redistributed, if any.

When you complete this step, your use of the guidelines is complete. Retain documentation of your decision for future use. Restrictions should be documented in the metadata. Provide information about the evaluation using metadata and/or licenses, signed agreements (including non-disclosure agreements), or other instruments that accompany the data to organizations that receive the data. As noted in Step 3, the documentation should include the identification of the geospatial data, the potential security concerns, findings determined by use of the guidelines, the actions taken, and (if needed) the authority or case law that supports the actions taken. Appendix 2 identifies elements in the "Content Standard for Digital Geospatial Metadata" (Federal Geographic Data Committee, 1998) that are available for documenting the use of the guidelines in the metadata.

Discussion: At this point you have determined that your organization has the authority to place limits on access to geospatial data, uses for which they can be applied, or redistribution of the data. Decide the extent of restrictions and document them in the metadata.

Originating organizations that restrict data should have written procedures and policies that identify data that can be accessed, used, and/or redistributed, the conditions under which these actions may occur, and organizations that are permitted to access, use and redistribute data that are restricted. Care should be taken to ensure that the release of the data to selected organizations does not enable other organizations to compel the release of the data under freedom of information or public records laws.

Such procedures and policies should be reviewed to ensure that they comply with available authorities. Restrictions should be commensurate with the security risk associated with the data. Organizations should identify present and potential users who have legitimate needs for the data. These may include first responders, law enforcement agencies, and emergency managers at the local, state, tribal, and Federal levels. Other organizations and research institutions may have legitimate reasons to use the data. Their requests should be granted if they provide proper safeguards and assurance that they will prevent unauthorized access to the data. Organizations that request sensitive data should ensure that they have the authority to honor the conditions under which they would receive the data.

For data that are released the originating organization should provide documentation to the recipient describing all obligations incurred by receipt of the data. These terms and conditions and any other obligations associated with possession of the geospatial data should be included in the metadata and/or in any licenses, agreements (including non-disclosure agreements), or other instruments that accompany the data. Such documentation also should cite the authority or other basis that permits the safeguards. Data that are safeguarded should be clearly labeled. Organizations could choose to follow up with recipients to ensure that safeguards are being observed.

Example: An organization may elect to establish one or more levels of restriction for geospatial data commensurate with the associated security risk, such as geospatial data being:

- Generally available to members of the public with use and redistribution restrictions. Recipients may be required to identify themselves before receiving the geospatial data.
- Available to other government agencies or nongovernmental organizations (for example, the Red Cross), with use and redistribution restrictions.
- Available only to law enforcement, first responder, and emergency management agencies with use and redistribution restrictions.

- Available only to "partner" agencies from other levels of government with use and redistribution restrictions.
- Available only within your organization.

Step 14 – Safeguarding is not authorized.

When you reach this step your use of the guidelines is complete. Retain documentation of your decision for future use. Provide information about the evaluation using metadata and/or licenses, signed agreements (including non-disclosure agreements), or other instruments that accompany the data to organizations that receive the data. As noted in Step 3, the documentation should include the identification of the geospatial data, the potential security concerns, findings determined by use of the guidelines, the actions taken, and (if needed) the authority or case law that supports the actions taken. Appendix 2 identifies elements in the "Content Standard for Digital Geospatial Metadata" (Federal Geographic Data Committee, 1998) that are available for documenting the use of the guidelines in the metadata.

Discussion: When an originating organization reaches this step, the authorized executive manager or legal counsel cannot give permission to safeguard data because no legal remedy exists or overruled the conclusion that the data require safeguarding.

Appendix 1: Sample Policies from Which Principles for the Guidelines Were Developed

The following list is a sample of policies from which the principles for the guidelines were developed. The list is not exhaustive. Attention was concentrated on policies that affect multiple organizations; individual organizations may have additional laws and other policies that control their actions.

Federal and State Laws

"An act to enhance the management and promotion of electronic Government services and processes by establishing a Federal Chief Information Officer within the Office of Management and Budget, and by establishing a broad framework of measures that require using Internet-based information technology to enhance citizen access to Government information and services, and for other purposes (Brief title: "E-government Act of 2002")." (Public Law 107-347, 17 Dec 2002) (See especially Section 216, "Common Protocols for Geographic Information Systems"): U.S. Government Printing Office web site at http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=107_cong_bills&docid=f:h2458en r.txt.pdf. (Accessed August 12, 2004)

"An act to establish the Department of Homeland Security, and for other purposes (Brief title: "Homeland Security Act of 2002")." (Public Law 107-296, 25 Nov 2002): U.S. Department of Homeland Security web site at http://www.dhs.gov/interweb/assetlibrary/hr_5005_enr.pdf . (Accessed August 12, 2004)

"Depository Library Program," Title 44 U.S. Code, Chapter 19, 2000 ed.: U.S. Government Printing Office web site at

http://www.access.gpo.gov/uscode/title44/chapter19_.html . (Accessed August 12, 2004)

"Emergency Planning and Community Right-to-Know," Title 42 U.S. Code, Chapter 116, 2000 ed.: U.S. Government Printing Office web site at http://www.access.gpo.gov/uscode/title42/chapter116_.ht ml. (Accessed August 12, 2004)

"Hazardous Air Pollutants," Title 42 U.S. Code, Section 7412, 2000 ed.: Available through U.S. Government Printing Office web site at

http://www.access.gpo.gov/uscode/title42/chapter85_subc hapteri_parta_.html. (Accessed August 12, 2004)

"Records excepted from disclosure requirements; names and addresses; time limitations; destruction of records," Indiana Code 5-14-3-4, 2003 ed. (see especially section (a)(19)): Indiana General Assembly web site at http://www.in.gov/legislative/ic/code/title5/ar14/ch3.html. (Accessed August 12, 2004)

"Scientific Inventory of Oil and Gas Reserves," Title 42 U.S. Code, Section 6217, 2000 ed.: Available through U.S. Government Printing Office web site at http://www.access.gpo.gov/uscode/title42/chapter77_subc hapteri_parta_.html. (Accessed August 12, 2004)

"Security of certain utility information," Maine Revised Statutes Title 35, Section 1311-B, 2003 ed.: Maine Office of the Revisor of Statutes web site at http://janus.state.me.us/legis/statutes/35-a/title35-asec1311-b.html. (Accessed August 12, 2004)

"Sensitive public security information," North Carolina General Statutes 132-1.7, 2003 ed.: North Carolina General Assembly web site http://www.ncleg.net/statutes/generalstatutes/html/bychapt er/chapter_132.html. (Accessed August 12, 2004)

Policies, Hearings, and Correspondence

Ashcroft, John, "Memorandum on the Freedom of Information Act, October 12, 2001." U.S. Department of Justice web site at

http://www.usdoj.gov/oip/foiapost/2001foiapost19.htm. (Accessed August 12, 2004)

Card, Andrew. "Memorandum on Action to Safeguard Information Regarding Weapons of Mass Destruction and Other Sensitive Documents Related to Homeland Security, March 19, 2002." U.S. Department of Justice web site at http://www.usdoj.gov/oip/foiapost/2002foiapost10.htm. (Accessed August 12, 2004)

U.S. Department of Justice, "Freedom of Information Act Guide". Washington: May 2004. U.S. Department of Justice web site at http://www.usdoj.gov/oip/foi-act.htm. (Accessed August 12, 2004)

U.S. Executive Office of the President. "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" (Executive Order 12898). Washington: February 11, 1994. Available through National Archives and Records Administration web site at http://www.archives.gov/federal_register/executive_orders /1994.html. (Accessed August 12, 2004)

U.S. Executive Office of the President. "Coordinating Geographic Data Acquisition and Access: The National

- Spatial Data Infrastructure" (Executive Order 12906). Washington: April 11, 1994. Available through National Archives and Records Administration web site at http://www.archives.gov/federal_register/executive_orders /1994.html. (Accessed August 12, 2004)
- U.S. Executive Office of the President. "Blocking Property and Prohibiting Transactions with Persons Who Commit, Threaten To Commit, Or Support Terrorism" (Executive Order 13224). Washington: September 23, 2001. U.S. Department of the Treasury web site at http://www.treasury.gov/offices/eotffc/ofac/sanctions/t11te r.pdf. (Accessed August 12, 2004)
- U.S. Executive Office of the President. "Critical Infrastructure Protection in the Information Age" (Executive Order 13231). Washington: October 16, 2001. Available through National Archives and Records Administration web site at http://www.archives.gov/federal_register/executive_orders/2001_wbush.html. (Accessed August 12, 2004)
- U.S. Executive Office of the President. "Further Amendment to Executive Order 12958, as Amended, Classified National Security Information" (Executive Order 13292). Washington: March 25, 2003. Available through National Archives and Records Administration web site at

http://www.archives.gov/federal_register/executive_orders /2003.html. (Accessed August 12, 2004)

- U.S. Executive Office of the President. Office of Management and Budget. "Management of Federal Information Resources" (Circular A-130, transmittal memorandum #4). Washington: November 28, 2000: U.S. Office of Management and Budget web site at http://www.whitehouse.gov/omb/circulars/a130/a130trans 4.html. (Accessed August 12, 2004)
- U.S. Executive Office of the President. Office of Management and Budget. "Coordination of Geographic Information and Related Spatial Data Activities" (Circular A-16). Washington: August 19, 2002: U.S. Office of Management and Budget web site at http://www.whitehouse.gov/omb/circulars/a016/a016_rev. html. (Accessed August 12, 2004)
- U.S. Government, 2003, U.S. Commercial Remote Sensing Policy: U.S. Geological Survey web site at http://crsp.usgs.gov/. (Accessed August 12, 2004)
- U.S. House. Committee on Transportation and Infrastructure, Subcommittee on Water Resources and the Environment, "Terrorism: Are America's Water Resources and Environment at Risk?" Hearing, 10 Oct 2001.

- U.S. House web site at http://www.house.gov/transportation/water/10-10-01/10-10-01memo.html. (Accessed August 12, 2004)
- U.S. House. Committee on Transportation and Infrastructure, Subcommittee on Water Resources and the Environment, "Right-to-Know after September 11th" Hearing, 8 Nov 2001. U.S. House web site at http://www.house.gov/transportation/water/11-08-01/11-08-01memo.html. (Accessed August 12, 2004)

Appendix 2: Documenting Use of the Guidelines in Metadata Accompanying Geospatial Data

This appendix identifies data elements in the "Content Standard for Digital Geospatial Metadata" (Federal Geographic Data Committee, 1998) that are available for documenting the use of the guidelines in the metadata.

Four types of information should be encoded in metadata: (1) the fact that the geospatial data and metadata were reviewed using the guidelines, (2) decisions that were made, (3) the date of the decisions, and (4) the safeguards (changes to the geospatial data or restrictions on access, use, or dissemination of the geospatial data and metadata) that were applied.

Provide an overview of the potential security concerns, the decisions made, the date of the decisions, and the safeguards applied using "Abstract" (element 1.2.1). Use "Supplemental Information" (element 1.2.3) to provide details about these activities. The text should document, or at least characterize, the potential security concerns, findings determined by use of the guidelines, the actions taken, the date of the decisions, and (if needed) the authority or case law that supports the actions taken. If safeguards are justified, describe them by documenting the types of changes made to the geospatial data and/or any restrictions on access, use, or dissemination. Describe any license, agreement, or other instrument that accompanies the data. Such documentation should also cite the authority for safeguarding.

To document changes made to the data, the best choices are elements available under "Data Quality Information" (element 2), which has available elements for reporting attribute accuracy, positional accuracy, logical consistency, completeness, and lineage. Report processes used to change the data under "Process Step" (element 2.5.2). If you decide not to use element 2, a less-preferred choice is to include information about changes in "Supplemental Information" (element 1.2.3).

To document the details about restrictions on access, use, or dissemination of the data:

- Report restrictions on access to the geospatial data under "Access Constraints" (element 1.7).
- Report restrictions on use or redistribution of the geospatial data under "Use Constraints" (element 1.8).

If your organization has a formal classification system you also can report the classification level of the geospatial data by category under "Security Information" (element 1.12).

Geospatial metadata can also be subject to safeguarding. To document the details of restrictions on access, use, or dissemination of the metadata:

- Report restrictions on access to the geospatial metadata under "Metadata Access Constraints" (element 7.8).
- Report restrictions on use or distribution of the geospatial metadata under "Metadata Use Constraints" (element 7.9)

If your organization has a formal classification system you also can report the classification level of metadata by category under "Metadata Security Information" (element 7.10).

References

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Federal Geographic Data Committee, 1998, Content standard for digital geospatial metadata (FGDC-STD-001-1998): Reston, Va, Federal Geographic Data Committee, 78 p. (Also available through the Federal Geographic Data Committee web site at http://www.fgdc.gov/metadata/contstan.html) (Accessed August 12, 2004)

National Academy of Public Administration, 1998, Geographic information for the 21st century: building a strategy for the nation: Washington, National Academy of Public Administration, 358 p.

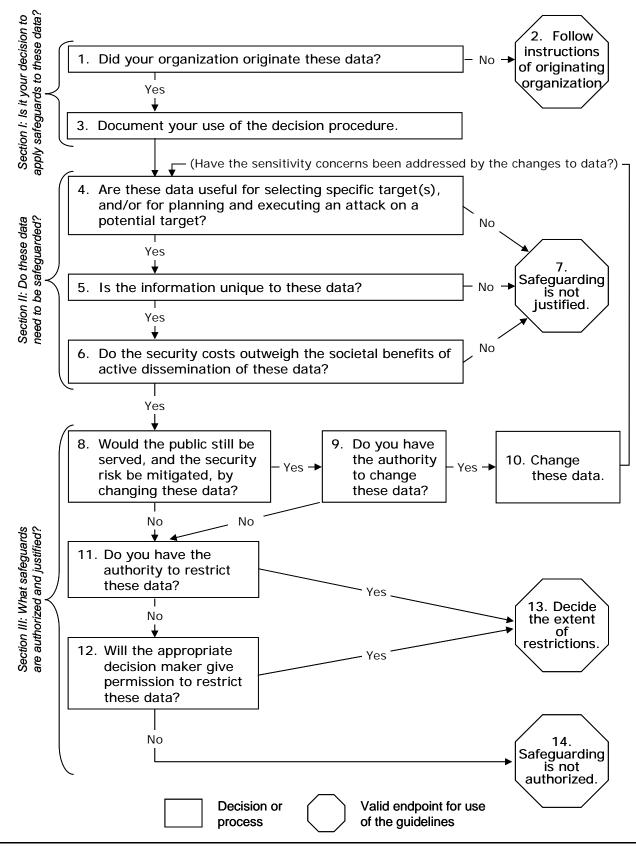
National States Geographic Information Council, 2002, Data access decision tree: National States Geographic Information Council web site at http://www.nsgic.org/hot_topics/security/080702_HS_Decision_Tree_CI_Data_Version7.ppt (Accessed August 12, 2004)

The following is the recommended bibliographic citation for the guidelines:

Federal Geographic Data Committee. Homeland Security Working Group. "Guidelines for Providing Appropriate Access to Geospatial Data in Response to Security Concerns". Washington: June 2005, 16 p. Available through Federal Geographic Data Committee web site at http://www.fgdc.gov/fgdc/homeland/index.html.

Figure 1. Decision Tree for Providing Appropriate Access to Geospatial Data in Response to Security Concerns

(Duplicate graphic that can be detached and used separately.)



ATTACHMENT C

NC OneMap Implementation: Initial Data Layers to Serve

NC OneMap Implementation: Initial Data Layers to Serve

Description		
Large-scale scanned and rectified aerial		
photographs		
County-based private and public property		
boundaries		
Centerlines of right-of-ways		
City/town boundaries		
County borders		
Extra-territorial jurisdictions – areas not		
in a municipality, but under authority of the city or town		
Locations and names of streams, rivers,		
lakes, ponds, etc.		
Horizontal and vertical survey control		
locations		
Ground elevations (depicted as contours,		
X/Y/Z points, elevation models, TINs?)		
Description		
Cadastral-based land use		
Statewide land cover - 1996		
Areas inundated by flood waters (1%		
annual chance, .2% annual chance, flood		
ways)		
Soil Survey Geographic (SSURGO) database produced by US Dept. of		
Agriculture, Natural Resources		
Conservation Service		
Non-taxable lands maintained in county		
cadastral databases		
Locations of railroad lines		
Point locations of airports and airfields		
Point locations of public and non-public		
grade schools		
Point locations of state universities and		
private colleges and universities		
Point locations of hospitals		
Estimated coastal areas inundated by hurricane storm surge		
Point locations where communities draw		
raw water from a lake, river, or stream,		
treat it, and distribute treated water to		
customers		
National Pollutant Discharge Elimination		
System - locations of individually		
permitted wastewater discharged into surface waters		
Point locations of police stations		
Point locations of fire stations		
Point locations of municipal/county		
landfills		

NC OneMap Implementation: Initial Data Layers to Serve

	Wildlife Service, National Wetlands Inventory
Hazardous Disposal Sites	Areas identifying locations of uncontrolled and unregulated, hazardous waste sites (formerly called superfund sites).
Building Footprints	Perimeter outlines of buildings
Future Land Use	Cadastral-based
Water Lines	Water pipe distribution network
Sewer Lines	Sanitary sewer pipe network
NC House Districts	Boundaries of NC House Districts
NC Senate Districts	Boundaries of NC Senate Districts
US Congressional Districts	Boundaries of US Congressional Districts
Demographics	2000 US Census Bureau data for blocks and blockgroups
Geographic Names	US Geological Survey official names for physical and cultural geographic features

ATTACHMENT D

Data Sharing Committee Business Case Summaries

ATTACHMENT D GICC Data Sharing Report

Business Case Summaries

Case #1: Road Centerline Data Distribution Center

The Statewide Mapping Advisory Committee's (SMAC) Working Group for Roads and Transportation (WGRT), a group comprised of representatives from NCDOT, MPOs, RPOs, COGs, and local governments, recently received an National Highway Safety Grant to develop a web based spatial data distribution site that will enable the sharing of local and state road data among local, regional, state, and federal government agencies. The Centerline Data Distribution Center (CDDC), which is being developed by CGIA in conjunction with the WGRT, will be restricted to registered users and limited to representatives from government agencies (the data will not be accessible to private entities or the public). It is anticipated that once the CDDC is active and a significant portion of eligible users of GIS road data are participating, the amount of staff time spent on acquiring and distributing road data will be greatly reduced. It has been estimated that the CDDC will save local, regional, state and federal governments \$130,000 annually in staff time (see Table 1 and 2 on page two of this attachment).

The benefits of this are two fold:

- 1. Governments that need local GIS road data will be able to go to a single site and download the latest datasets.
- 2. Local governments can direct governmental users of their data to the CDDC and reduce the amount of time that they spend fulfilling data requests.

Note that the cost savings are only achieved if local governments are willing to share their data without cost to other public non-commercial agencies.

Case #2: Surface water data sharing through stakeholder development

In 2004, the North Carolina General Assembly requested the NC Geographic Information Coordinating Council and the Department of Environment and Natural Resources to develop an implementation plan to improve the digital surface waters of the state. The Stream Mapping Working Group developed a five-year \$16.2M plan for developing the high resolution digital surface water mapping dataset.

Through the Hurricane Recovery Act of 2005, the General Assembly provided funding for the first phase of production encompassing nineteen (19) counties in western North Carolina. Established as the North Carolina Stream Mapping Project, the project dataset is based on the National Hydrography Dataset (NHD) data model. This data model supports

WGRT CDDC Local Road Data Sharing

Summary: Based on staff time estimates for distribution and acquisition of local data, the Centerline Data Distribution Center (aka the Working Group for Roads and Transportation Local Road Data Sharing Initiative) will reduce the amount of money spent gathering local data on a local, regional, state, and federal levels by \$130,000 a year.

Table 1: Current Expenditures on Acquiring and Distributing Local Road Data

Agency	Current expenditures					
	Number of Staff	Staff Time	Counties/ Datasets*	Frequency (annually)	Hourly Wage	Total Cost
Data Acquisition						
DOT GIS	1	0.25	150	2	30	\$ 2,250
Other DOT Divisions/Branches	10	0.25	12	3	30	\$ 2,700
DENR	15	0.25	12	3	30	\$ 4,050
Other State Agencies	8	0.25	150	2	30	\$ 18,000
Federal Agencies	10	0.25	150	3	30	\$ 33,750
MPOs & RPOs	37	0.25	9	4	30	\$ 9,990
County Governments	100	0.25	5	4	30	\$ 15,000
Local Governments	50	0.25	5	4	30	\$ 7,500
Total Amount spent on acquiring local road data	231					\$ 93,240
Data Distribution						
County Governments	1	0.17	100	100	30	\$ 51,000
Local Governments	1	0.17	50	100	30	\$ 25,500
Total Amount spent on distributing local data	2					\$ 76,500
Total Amount (Distribution and Acquisition)	229					\$169,740

*DOT GIS, Other State Agencies, and Federal Agencies Estimated based on 100 Counties and 50 Local Governments Collecting Local Road Data, other estimates based on experience at an MPO

Table 2: Projected Expenditures on Acquiring and Distributing Local Road Data after CDDC Implementation

Agency	Expenditures after the CDDC					
	Number of Staff	Staff Time**	Counties/ Datasets*	Frequency (annually)	Hourly Wage	Total Cost
Data Acquisition	Data Acquisition					
DOT GIS	1	0.09	150	2	30	\$ 810
Other DOT Divisions/Branches	10	0.09	12	3	30	\$ 972
DENR	15	0.09	12	3	30	\$ 1,458
Other State Agencies	8	0.09	150	2	30	\$ 6,480
Federal Agencies	10	0.09	150	3	30	\$ 12,150
MPOs & RPOs	37	0.09	9	4	30	\$ 3,596
County Governments	100	0.09	5	4	30	\$ 5,400
Local Governments	50	0.09	5	4	30	\$ 2,700
Total Amount spent on acquiring local road data	231					\$ 33,566
Data Distribution						
County Governments	1	0.09	100	12	30	\$ 3,240
Local Governments	1	0.09	50	12	30	\$ 1,620
Total Amount spent on distributing local data	2					\$ 4,860
Total Amount (Distribution and Acquisition)	229					\$ 38,426

*DOT GIS, Other State Agencies, and Federal Agencies Estimated based on 100 Counties and 50 Local Governments Collecting Local Road Data, other estimates based on experience at an MPO **Based on 5 minutes per dataset for upload and download, which may be high considering you can upload and download multiple datasets in the interface.

various scales of data representation, while meeting a range of analytical and cartographic requirements.

The Stream Mapping Working Group, and later the Stream Mapping Project Advisory Committee, are examples of the stakeholder community joining together to compile and coordinate business requirements to guide technical decisions in the development of the data product. This process helps ensure the end datasets is useful to the broadest range of business requirements across the stakeholder community. The implementation plan identified six business cases for projecting the value of process efficiencies and cost avoidances resulting from the development of the dataset; the projected cost avoidance or efficiency for each case is listed in Table 3. Over time, additional business cases will be documented to further increase the ratio between production costs and ongoing maintenance compared to cost avoidances and efficiencies realized across the stakeholder community.

Table 3		
Business Case	Stakeholder(s)	Value of efficiency or cost avoidance
1	NC Dept of Transportation / Ecosystem Enhancement	\$6,150,000
	Program: Efficiencies gained in better planning support restoration of additional stream miles.	
2	City of Durham: Improved surface water mapping will require	\$215,730 annually
	fewer staff hours to review permits.	
3	NC Wildlife Resources Commission: Increased efficiency in	\$20,595
	permit reviews.	
4	US Geological Survey: Time to calculate flood frequency	\$945 per calculation
	statistics for an ungauged stream reduced from 16 hours to 15	
	minutes of staff time.	
5	Development Community: Significant reduction in field work	\$450,000
	required by developers to file permits with NC DENR-Division	
	of Water Quality	
6	NC Department of Commerce: Better decision making for site	* No value calculated in
	selection criteria in industry recruitement.	Implementation Plan

The NC Stream Mapping dataset also provides a common definition and workflow for the development and exchange of information between users within the community. The dataset utilizes the NHD concepts of *reach codes* and *event tables*. Reach codes are identifiers within the database for relating spatial attributes and business data to stream segments and water bodies. Event tables allow the stakeholders to relate spatial attributes and business data to the network of stream features. Stakeholders will be able to share data by exchanging reach code tables or event tables and relating them to the NC Stream Mapping dataset hosted in NC OneMap. This removes the costly and inefficient process of conflation as a surrogate for data sharing, while simultaneously enabling the efficient sharing of business data across federal, state, and local users.

Case #3: National Agricultural Imagery Program (NAIP)

The USDA-FSA, in conjunction with other federal agencies, acquires growing season leafon aerial photography on a yearly basis at 1 or 2 meter resolution. Two (2) meter resolution is the standard for most years with one (1) meter resolution imagery coming up every 5 to 6 years in a recurring cycle. However, to fly 1 meter resolution imagery requires cost sharing from the state and/or another federal agency.

In 2006, the data for North Carolina was acquired at 1 meter resolution during the prime growing season. The state contributed elevation data to the NAIP contractor for use in ortho rectification during post-collection processing. A state can buy up to 1 meter resolution NAIP in any of the years between the scheduled 1 meter flights by contributing to the overall cost of the project and can arrange with the NAIP contractors to deliver NAIP imagery in other radiometric configurations such as Color Infrared (CIR). The advantage of NAIP is that it provides a consistent, current statewide ortho photography data set that can be renewed each year if desired.

DENR Forest Resources uses NAIP as a consistent statewide imagery dataset that is current and because it has full tree canopy. Successive years of NAIP would aid in a forest stewardship program, helping in spotting areas where disease may be gaining a foothold, where vegetation types were undergoing higher than normal change, or to help identify areas where landowners were not following BMP's.

NAIP, especially CIR, can also be used as an aid in identifying potential wetland areas for restoration and protection by the Ecosystem Enhancement Program and the Division of Water Quality Wetlands Unit.

The Natural Heritage Program and the Wildlife Resources Commission are using NAIP imagery to aid in habitat analysis and to assess its loss in significant natural communities over time.

Local governments could also use NAIP imagery in projects that serve the local constituency. ATTACHMENT D1 is a report from a study performed for the City of Salisbury by American Forests, looking at dollar savings related to air pollution removal, carbon sequestration and storage, and storm water issues related to runoff and contaminant loading. Satellite imagery was used for this study by the contractor and is not available as a deliverable due to licensing restrictions. NAIP imagery was not available at the time but could have been used and would have been retained by the city GIS department for follow-up study and other uses.

Case #4 USDA Animal Disease Response

1) From the perspective of the US Department of Agriculture, Animal and Plant Health Inspection Service, Veterinary Services (USDA APHIS VS), the first line of response to animal disease outbreaks in North Carolina is at the state and industry level. Often, the State has already initiated an Incident Command System and is seeking and managing geospatial and epidemiologic data in response to animal disease outbreaks. When an outbreak 1) involves a foreign animal disease or 2) becomes larger or more widespread, to the point where state and industry resources cannot keep up with the incident, USDA APHIS VS is called in to assist.

When USDA APHIS VS gets involved, an Emergency Management Response System is used to capture and store outbreak information on animal exams, appraisals, depopulation, disposal, cleaning and disinfection, and other tasks that need to be managed. It includes a mapping module which allows some simple visualization and selection of point locations for zonation and surveillance/eradication activities. It also allows loading of local data on premises or other background geospatial data from a local source.

The North Carolina Department of Agriculture has developed a non-public Multi-Hazard Threat Database for use during such incidents. This database, populated with data from both state and local governments and from the various animal industries and having GIS and mapping capabilities, is critical when the federal response team from USDA is activated. When a state or industry has collected, validated, and manages data within the state, those data can be loaded to the USDA Emergency Management Response System, thus allowing quicker deployment of USDA surveillance teams in the field to support incident management.

Data sharing during these incidents is 1) crucial to quick response, 2) can be crucial to the welfare of animal and human populations, and 3) crucial to the continued trade in livestock and livestock food products around the world.

North Carolina may have the only statewide Multi-Hazard Threat Database of this kind in the United States. It is a very important step forward but is significantly dependent on the input and sharing of current data by and between federal, state, local, and industry partners to maximize its potential. Industry participation seems to rest largely on the ability and willingness of the data receivers to hold the data in confidence and limit access to it to those who have a "need to know" during an incident.

While no quantitative data has been found to specifically show dollars saved through quick and decisive response to animal disease outbreaks, it is assumed that the ROI for the Multi-Hazard Threat Database would be substantial given the level of commerce that exists in North Carolina for animals and animal products.

Case #5: Hurricane Isabel Data Request from FEMA.

In 2002 the North Carolina Department of Agriculture & Consumer Services (NCDA&CS) began collecting and standardizing local county data on a yearly basis. The primary goal was to create a statewide tax parcel layer and a statewide street centerline layer to aid in emergency response and planning. Hurricane Isabel struck the North Carolina Coast in September of 2003 causing extensive damage in eastern North Carolina. The Federal Emergency Management Agency (FEMA) contacted NCDA&CS requesting the tax parcel data for the 26 federally declared disaster counties. NCDA&CS was able to provide standardized data for the region as a result of local government cooperation during the data collection process. FEMA was able to use the data to begin recovery efforts in eastern North Carolina in a timelier manner.

Areas for improvement:

- 1. Timeliness of data. Create a centralized storage point for county data at the state level. Counties would be able to upload data either on a schedule or as requested. As delivered to FEMA the data ranged from two to six months old.
- 2. Standardization of attribute data. Once the data was collected, a substantial number of man hours were used formatting the data so that it could be loaded into a single statewide data set.
- 3. FGDC compliant metadata or a data dictionary. This would help in trying to understand the attributes listed and how they relate to other counties data.

Areas that worked:

- 1. Local government cooperation. For the most part local agencies were able and willing to send data in a usable format via ftp or by mailing a cd/dvd.
- 2. Redistribution of a single statewide data set to the federal government for use in disaster recovery. Prevented FEMA from having to request data from local agencies whose main priority would have been recovery and not processing a data request.
- 3. Cost savings. Due to the lack of an official monetary figure for savings the best measure is probably time. With a completed dataset in hand FEMA was able to begin making decisions immediately instead of having to wait for data to be collected and standardized for use.

In another case study conducted after H. Isabel, the benefits were identified of having parcel data in place and coordinated statewide in advance of events and having 'core' parcel data published on a regular basis. The report highlights five specific findings for sharing of parcel data for emergency response, including the savings of time to assessors and adjusters for purposes of insurance claims and federal disaster loans, as well as other activities. The report also offers recommendations, including one to identify best practices for coordinating a published version of parcel information at the State level. See ATTACHMENT D2.

ATTACHMENT D1

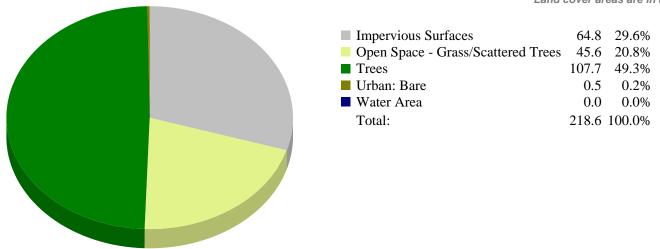
American Forests and CITYGreen Calculating the Value of Nature



Analysis Report for N MAIN STUDY AREA



Land cover areas are in acres.



Total Tree Canopy: 107.7 acres (49.3%)

Air Pollution Removal

By absorbing and filtering out nitrogen dioxide (NO2), sulfur dioxide (SO2), ozone (O3), carbon monoxide (CO), and particulate matter less than 10 microns (PM10) in their leaves, urban trees perform a vital air cleaning service that directly affects the well-being of urban dwellers. CITY green estimates the annual air pollution removal rate of trees within a defined study area for the pollutants listed below. To calculate the dollar value of these pollutants, economists use "externality" costs, or indirect costs borne by society such as rising health care expenditures and reduced tourism revenue. The actual externality costs used in CITY green of each air pollutant is set by the each state, Public Services Commission.

Nearest Air Quality Reference City: Roanoke

Rounone	<u>Lbs. Removed/yr</u>	<u>Dollar Value</u>
Carbon Monoxide:	192	\$82
Ozone:	4,418	\$13,572
Nitrogen Dioxide:	960	\$2,950
Particulate Matter:	3,841	\$7,879
Sulfur Dioxide:	1,056	\$793
Totals:	10,468	\$25,276

Carbon Storage and Sequestration

Trees remove carbon dioxide from the air through their leaves and store carbon in their biomass. Approximately half of a tree's dry weight, in fact, is carbon. For this reason, large-scale tree planting projects are recognized as a legitimate tool in many national carbon-reduction programs. CITYgreen estimates the carbon storage capacity and carbon sequestration rates of trees within a defined study area.

Total Tons Stored: 4,635.92

Total Tons Sequestered (Annually): 36.09



Analysis Report for N MAIN STUDY AREA



Stormwater

Trees decrease total stormwater volume helping cities to manage their stormwater and decrease detention costs. CITYgreen assesses how land cover, soil type, and precipitation affect stormwater runoff volume. It calculates the volume of runoff in a 2-year 24-hour storm event that would need to be contained by stormwater facilities if the trees were removed. This volume multiplied by local construction costs calculate the dollars saved by the tree canopy. CITYgreen uses the TR-55 model developed by the Natural Resource Conservation Service (NRCS) which is very effective in evaluating the effects of land cover/land use changes and conservation practices on stormwater runoff. The TR-55 calculations are based on curve number which is an index developed by the NRCS, to represent the potential for storm water runoff within a drainage area. Curve numbers range from 30 to 100. The higher the curve number the more runoff will occur. CITYgreen determines a curve number for the existing landcover conditions and generates a curve number for the conditions if the trees are removed and replaced with the user-defined replacement landcover specified in the CITYgreen Preferences. The change in curve number reflects the increase in the volume of stormwater runoff.

Water Quantity (Runoff)

2-yr, 24-hr Rainfall: 3.75 in.

Curve Number reflecting existing conditions: 76
Curve Number using default replacement landcover: 92

Additional stormwater

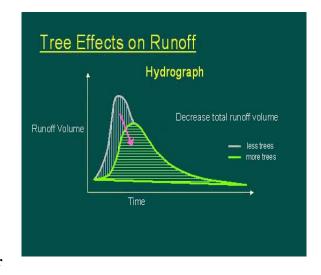
storage volume needed: 1,053,062 cu. ft.

Construction cost per cu. ft.: \$2.00

Total Stormwater Savings: \$2,106,124

Annual costs based on payments over 20 years at 6% Interest:

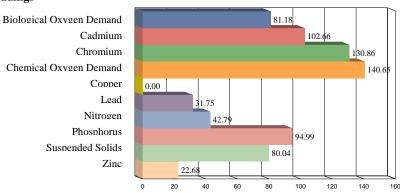
at 6% Interest: \$183,621 per year



Water Quality (Contaminant Loading)

Cities must comply with Federal clean water regulations and develop plans to improve the quality of their streams and rivers. Trees filter surface water and prevent erosion, both of which maintain or improve water quality. Using values from the US Environmental Protection Agency (EPA) and Purdue University's L-thia spreadsheet water quality model, American Forests developed the CITYgreen water quality model. This model estimates the change in the concentration of the pollutants in runoff during a typical storm event given the change in the land cover. This model estimates the Event Mean Concentrations of Nitrogen, Phosphorus, Suspended Solids, Zinc, Lead, Copper, Cadmium, Chromium, Chemical Oxygen Demand(COD), and Biological Oxygen Demand (BOD). Pollutant values are shown as a percentage of change.

Percent Change in Contaminant Loadings



ATTACHMENT D2

Parcel Data and Hurricane Isabel, A Case Study

Parcel Data and Hurricane Isabel A Case Study

Prepared for the FGDC Cadastral Subcommittee

by

David Stage and Nancy von Meyer

July 2004

Parcel Data And Hurricane Isabel: A Case Study

By David Stage and Nancy von Meyer

This case study is the product of a workshop that was organized by the Federal Geographic Data Committee's (FGDC) Subcommittee for Cadastral Data (Cadastral Subcommittee) and the Eastern States Cadastral Steering Committee with participants from local, state and federal agencies. Its purpose was to determine the utility of parcel data to emergency responders and the barriers to making this data available to them.

Introduction

Recent innovations in communication and Geographic Information Systems (GIS) technology has greatly improved the ability of emergency response agencies to prepare and react to hurricanes. On September 18, 2003, Hurricane Isabel made landfall on the Outer Banks of North Carolina. At the Army's Field Research Facility in Duck, North Carolina 100 miles north of where the eye cut across Hatteras Island, the Category 2 hurricane generated a five foot storm surge that

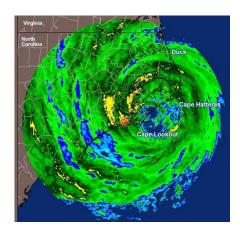


Figure 1: Radar Image of Hurricane

exceeded twenty seven years of measurements (http://coastal.er.usgs.gov/hurricanes/isabel/). One of the hardest hit areas was Hyde County North Carolina which alone sustained damages of more than 13 million dollars. The county was among those declared a major disaster area.¹

The size and intensity of Hurricane Isabel had been tracked for two weeks and land fall was predicted far enough in advance to safely evacuate the communities that were in the path of the storm. Once Isabel had gone inland emergency response agencies were able to use GIS to integrate post storm aerial photography, rainfall measures and elevation data with the county's detailed digital maps of properties, structures, utilities and road networks. This information provided responders with a very powerful tool that allowed them to more effectively respond to flooding, power outages, debris removal, and the disbursement of emergency relief funds. Unfortunately this technology could not be fully utilized because local data was not always available in a digital format. Some communities that were directly in the path of the storm were unable to provide responders with data because they did not have the time to provide it to the state's GIS coordinating agency. Some of the more rural communities simply did not have data because they had neither the resources nor the expertise to convert their paper maps into a digital format

The Cadastral Subcommittee met in the fall of 2003 to identify situations where parcel data was needed to respond to natural disasters and to meet homeland security requirements. Many of the subcommittee representatives were from the Southeast and the focus of discussion became the

¹ Blake Harris, "Resurrecting the Court", Government Technology, March 2004, page 42-43

on-going recovery effort with Hurricane Isabel. As a result a workgroup was established that consisted of Eastern Cadastral Steering Committee members and Federal Emergency Management Agency (FEMA) staff in Atlanta. They tasked themselves to evaluate the utility of parcel data in an emergency response situation and to identify issues that limited access to local parcel databases. A one day facilitated workshop that was funded by the Bureau of Land Management (BLM) and the US Geological Survey (USGS) was held in late January 2004 in Raleigh, North Carolina with more than thirty federal, state, and local representatives that had been involved with Hurricane Isabel. Participants described events that they had experienced during the different phases of emergency response operations and the importance of parcel data to addressing their problems and issues.

WORKSHOP FINDINGS

It became immediately apparent that local governments had a wealth of digital GIS information that could be extremely beneficial to emergency responders. This data was available from over half of the affected counties and the accuracy and currency was much better than the Census data that FEMA has had to rely on. Many examples were given on how digital parcel information from local governments could improve the ability of FEMA and state agencies





Figure 2: A coastal area before and after the storm.

to respond to emergency situations. Input from the workshop participants was collected and compiled according to the five major stages of emergency operations: *Pre-Event, Response, Recovery, Mitigation, and Planning* (see Appendix A, Table 2).² Five specific findings were derived from the workshop.

1) Parcel data provides intelligence to maps and imagery providing information about land ownership, property values, structures, and land use.

The workshop revealed that parcel data sets from local and county governments can provide essential detail about the land that serves emergency responders during all phases of an event. Knowledge of who owns the land, the value of improvements, current use, and the materials used in the construction of buildings is all essential information for emergency response staff in any disaster. Before the storm, when it became apparent that Isabel was going to strike the Outer Banks, participants from counties in the projected path reported that they were inundated with calls from homeowners and businesses concerned about their vulnerability to the potential storm surge. The counties that had digital parcel maps were able to quickly respond to these questions by overlaying the parcel data layer with elevation data identifying the threat to individual properties. After the storm had passed and the efforts moved from Pre-Event and Response to Recovery, parcel data was used to expedite relief to homeowners and business for both insurance claims and federal emergency loans. When assessors and insurance adjusters go into the field to make their damage assessments it takes some time to become oriented to a radically altered environment even for individuals that are familiar with the community (Figure 2). As a consequence it could require two and three trips

² Barabar Schauer, Earth Observation Magazine, "Hazus A Revolution in Rick Assessment" April/Map 2004 pages 4-9.

to a site to locate a property, acquire appropriate documentation, and then assess the damages. The counties that had digital parcel databases were able to provide the claims adjusters with GPS technology and portable databases that allowed them to confidently determine property

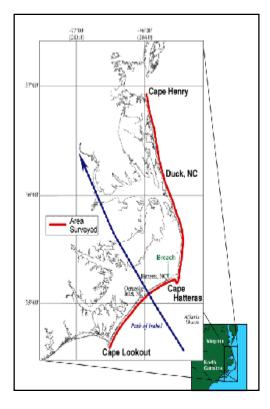


Figure 3: Hurricane Isabel's Path.

ownership and provided immediate access to all the information that they needed to assess the damage to a property. The assessment could be accomplished in one trip to the site greatly expediting the reporting process and the delivery of financial assistance to the property owners.

2) Integration of parcel data with other data sets and land characteristics provides a rich and stable data source.

A county parcel database typically has a six to ten foot horizontal accuracy providing the best

spatial reference of the terrain. When these layers are integrated with aerial photography and other themes, locating critical infrastructure such as fire hydrants, water lines, parcel elevation, the nearest cross street, and other features can be found quickly and automatically. Time and again in the workshop participants identified the need to link information to a location based on human activities. A local county parcel database was the only data source that was able to meet those requirements. One of the more striking examples demonstrating the importance of parcel data integration occurred during the previous winter. Tracking power availability is one of the more critical monitoring activities during winter ice storms when the loss of heat can be fatal to the elderly and handicapped. Typically a utility company's electric networks are spatially tied to the transformer and not to the meters on the houses and as a consequence it is not possible to monitor whether individual properties had power or not. This was solved by linking the transformers customer list to the parcel database immediately providing a map of the status of individual residences.

3) Parcel data must be published in a format to meet national and local emergency response needs.

The workshop participants identified two critical requirements to efficiently integrate parcel data into emergency management regional databases. First, the county should publish a subset of their parcel database on an annual basis in a standard format that includes information needed by emergency responders. This subset of the county's data is termed the "core" data by the Cadastral Subcommittee.³ Second, these published databases must be readily accessible off-site and provided to outside agencies in a structure that can be easily integrated with other published data sets. Because these conditions

³ Cadastral Subcommittee, *Cadastral Core Data - Version 2*, FGDC Cadastral Subcommittee, 10/01/2001, Internet http://www.nationalcad.org/data/documents/CadCoreDataDraft.pdf

were not met during the early stages of *Response* and *Recovery*, emergency responders had to rely on ancillary databases that were much older and less accurate than what local government had in their databases. The Cadastral Subcommittee has proposed a draft core data standard to meet the needs of the National Map, but the "core" data elements that will best serve the emergency response community still needs to be defined and included as part of the standard.

4) The use of parcel information must be integrated into emergency response protocols.

Protocols used by FEMA are a set of rules and procedures that are followed in any emergency event. These "checklists" provide order and consistency during the chaotic events of an emergency ensuring that resources and materials are available when and where they are needed. During pre-event planning or in the aftermath of an emergency, the value of locally maintained parcel information is clear, but if this data is not a part of the protocol then the use of this valuable resource may be missed. Defining the standard and then adding collections of parcel information to FEMA protocols will provide the necessary lead time for counties to know how to package their information into a format that can be incorporated into the time critical response and recovery efforts. A notable example occurred in Onslow County, North Carolina, where staff had generated maps showing downed trees, affected structures, and areas of critical damage for their local response agencies. This information had to be regenerated into text-based tables for emergency response teams because the use of these maps was not part of the FEMA protocol.

5) Develop programs to promote parcel data automation and maintenance in less urban areas.

While North Carolina represents a stellar example

of state-county cooperation in the development of land records programs and parcel automation, many of the less populated rural counties in other states have not begun land records modernization efforts because the resources are not available. The advantage to counties that have converted their parcel maps into digital form was dramatically demonstrated in the recovery phases for everything from the time it took to restore power to the processing of claims and the delivery of disaster relief funds.

A recent study has shown that approximately 60% of the parcels in the US are in a format that can be used in a GIS, but they are mostly in the more urban areas.4 States that have parcel conversion programs that implement standards and assist with the conversion of parcel maps to digital formats have demonstrated great success in the more rural areas. Two examples bear witness to this claim. In 1998 Florida counties reported that forty-seven percent of the state's nine million parcels had been converted into a digital form. That year the Florida Department of Revenue began a program to assist the more rural counties with the conversion of paper maps into digital parcel databases. By 2004 over ninety percent of the state's parcels had been converted and the remainder are expected to be complete by 2006. The second example is Alabama, which is mostly rural compared to Florida. The Alabama Department of Revenue currently has a similar program under way and they have converted 75% of the state's parcels with complete coverage for 35 of their 67 counties. This is well above the national average of 60%.5

OTHER OBSERVATIONS AND EXAMPLES OF HOW PARCEL DATA WAS USED IN AN EMERGENCY SITUATION

The participants in the workshop had many examples of how parcel databases were critical in

Stage, David. An Assessment of Parcel Data in the United States, Surveying and Land Information Science, 2003, Vol. 63, No. 4, p. 235-241.
 Elrod, Allen. Alabama Department of Revenue, Eastern States Cadastral Forum, Atlanta, URISA, October 13, 2003

saving time, money and lives. The following are a few specific examples from the workshop that illustrate how important a digital parcel database can be.

Flooding: The most destructive force in a hurricane is the flooding that is caused by heavy rain fall. It is possible for areas to receive ten or more inches of rain in a 24 hour period. An incident occurred in North Carolina during Hurricane Fran in 1996. Enough rain had fallen that the Army Corps of Engineers determined that water needed to be released from North Carolina's Falls Lake Dam into the Neuse River. Time was critical and it was imperative that residents in the river basin were notified so they could be evacuated. Wake County was able to digitally overlay their parcel database with an elevation model of the area adjacent to the river identifying the homes that were in the most dangerous locations. Because residents could not be contacted due to power and phone outages, maps were printed that identified the homes at risk of flooding. These maps were given to Sheriff Deputies who were then able to go directly to the at risk homes to notify the occupants.

Agriculture and Aerial Spraying: After an event like Hurricane Isabel it is important to spray insecticides to reduce the dangers of diseases spread by mosquitoes to both humans and livestock. Typically this is airborne spraying with spray block planning based on post-event aerial photography to identify water retention areas. Aquaculture areas can be identified by visual inspection of aerial photography and where spraying concentrations are dangerous to the livestock, these areas can be avoided. However, organic farms can be easily overlooked in a visual inspection. If organic farms are included within the spray block or there is overspray from an

adjoining block, the results can be economically devastating. A loss of organic farm certification will remain in effect for three years, significantly impacting the income of the farmer. A digital parcel database can be combined with imagery to provide the intelligence needed to assist in the identification sensitive crops and livestock.

Farm Animals: The care and feeding of farm animals after an event is another important consideration. Farm animal food supplies are often destroyed in a disaster and rapid response with large volumes of supplemental feed is essential for the survival of the livestock and the continued economic viability of the farm operation. Navigation to sites in rural communities can be difficult because of the loss of signage for local roads, loss of landmarks, and the lack of an addressing system for farm parcels. The representative from the North Carolina State Agriculture Office pointed out that most farmers regularly use and know the parcel identification number for their properties. Having the property number that is in a digital parcel database can assist with the routing of feed trucks to the sites and assure timely delivery of feed.

Human resources limits access to local government data in impacted counties: As demonstrated in Hurricane Andrew access to local data is limited by staffing of the local government information systems office. If this data has not already been prepared for publication it may not be accessible for several reasons.⁶

- 1. The number of staff that understand the computer systems, software, and programs that can deliver products are limited.
- 2. Staff that have the skills and knowledge to provide the necessary information to emergency responders live in the disaster area. At the same time they are most needed by the community they are also needed by their families.

⁶ Local Preliminary Impact Assessment for Hurricane Andrew, Metro-Dade Geographic Information Center, Office of Computer Services, 1992 (unpublishded)

3. Staff that have expertise in using and accessing parcel data have physical limitations. This was demonstrated in Dade County, Florida in 1992 in the aftermath of Hurricane Andrew; those staff that could make it into their offices were only able to work for a limited time. After long shifts lasting twenty-four to thirty-six hours the flow of information stopped because staff were exhausted.

Backup Sites: There is a need for parcel data to be available from multiple sources. Serving parcel information with other data sets from distributed sites such as The National Map-NC/OneMap Project (http://www.nconemap.net) serves two needs: First it makes data available even when power outages or damage prevent local servers from providing the information; and secondly it optimizes distributed technology so that remote sites can harvest or mirror current information continuously rather than relying on periodic updates. Counties in the path of the hurricane were responding to immediate needs and struggling with power outages and system recovery. Redundant or back up sites allowed state and federal emergency staff to access the information they needed without putting additional workload on an already overloaded local staff.

Off-line Data: The data that is to be used in an emergency response environment must be published and available in secure mediums such as DVD's or portable hard drives in a "ready to go" format. During emergencies, communication networks are frequently disrupted and access to the networks is often unavailable. More importantly for security reasons access to webbased data sources are off limits in many emergency response control rooms. The threat of computer virus infections or corrupted data at critical moments can have disastrous consequences.

RECCOMENDATIONS

Digital parcel data is becoming readily available

from more communities every year, particularly in areas with populations that are greater than 150,000. Obstacles to using and sharing digital parcel data are more often institutional in origin; an absence of data standards, the lack of appreciation for the utility parcel data, and the inadequacy of the infrastructure needed to compile the data into regional coverages were the most frequently cited problems. Issues related to files size, speed of access, integrating software and file transfers have all been fundamentally resolved. The workshop participants all agreed that there is great value in using locally maintained parcel data for emergency response operations because the information about landownership, structures and property values are current and accurate. Four recommendations that address these issues are presented below:

Recommendation 1: Establish Parcel Data Conversion Programs for Rural Counties:

Task 1: Identify and publish the best practices for programs that will assist rural counties in the conversion of the parcel maps into a digital format.

Responsibility: FGDC Cadastral Subcommittee in association with the principle federal beneficiaries of an automated rural parcel data (BLM, FEMA, Census).

The conversion of parcel maps into a digital format is occurring in communities that have the tax revenue to support GIS services. Generally, rural counties of less than 50,000 are not able to initiate data conversion projects without outside funding or technical assistance. Several states in the Southeast have programs in place that provide technical support and cooperative funding to bring this technology into smaller communities. Hurricane Isabel demonstrated that

when disasters strike large areas many rural regions of the country may be caught short:

- The Census Bureau's data shows that metropolitan areas represent approximately 78% of the US population but only 20% of the land mass.⁷
- Sixteen of the twenty-six counties in the disaster area had less than 20,000 parcels.
- Only four counties in the disaster area provided data to the North Carolina corporate database before the 2003 hurricane season.

Funding of conversion from paper format to a standard digital format is achievable; cost range from \$4.25 to \$15.00 per parcel depending on the approach taken.8 Experience with conversion assistance programs such as Florida's has shown that if these programs can ensure adherence to standards and access to data, regional governments are interested in contributing to cooperative funding programs.9

Recommendation 2: Include the use of Parcel Data in Emergency Response Protocols

Task 2: Determine the business requirements related to parcel data for the emergency responders in western states.

Responsibility: FGDC Cadastral Subcommittee and the Eastern and Western Cadastral Steering Committees.

Task 3: Finalize a parcel core data standard that will define a publication data content standard for the nation.

Responsibility: FGDC Cadastral Subcommittee and the Eastern and Western Cadastral Steering Committees.

The Hurricane Isabel Workshop identified the business requirements to address the needs that are specific to hurricanes as well as touching on a few other emergencies. Although the results of the workshop affect all of the Gulf and Eastern Seaboard we can not assume that these results accurately reflect the entire US for several reasons: 1) most natural disasters in the Western United States are wildfires and not hurricanes; 2) population density is much greater in the eastern states; and 3) BLM and the US Forest Service have a small presence in the eastern states although they are ubiquitous in the west. Finalizing core parcel data requirements for emergency responders and developing appropriate protocols for all emergency situations makes it necessary to acquire input on western state parcel data issues.

Task 4: Establish protocols to incorporate parcel data into emergency response operations.

Responsibility: FEMA, FGDC Cadastral Subcommittee, and the Eastern and Western Cadastral Steering Committees

The emergency response protocol is a checklist of operational procedures that is followed during an emergency operation. To assure that parcel data is not an adhoc activity procedures and data formats need to be included in the protocols that will meet the entire spectrum of emergency response needs.

Recommendation 3: Identify Best Practices For Coordinating Parcel Information at the State Level.

Task 5: Complete a national inventory of how states centrally organize or manage statewide parcel data.

US Census Bureau, GCT-P. Metropolitan Area Population by Size Class: 2000, Census 2000 Summary File 1 (SF 1) 100-Percent, Data. Online.Internet. September 2003. Available at http://www.census.gov
 Burgess, Bill. National States Geographic Information Council, US Mapping Cost Model, 2002
 Stage, David. Florida Department of Environmental Protection. Florida Department of Environmental Protection Cadastral

Feasibility Study. 25 Sept. 2003.

Responsibility: FGDC Cadastral Subcommittee and the National States Geographic Information Council (NSGIC)

The creation of a seamless integrated statewide parcel database depends on the infrastructure that is available to centrally collect and organize this information. There are approximately 2,900 county and 1,500 municipal agencies responsible for managing and collecting parcel data for private lands in the US.¹⁰ Federal agencies and tribal nations are also a significant source of parcel data, particularly in the western states. The status and methods that different states use to centrally organize, manage or compile parcel data is not well documented.

Recommendation 4: Identify and Document The Best Practices For Access to and Distribution of Parcel Data.

Task 6: Document the data stewardship responsibilities for parcel data management.

Responsibility: FGDC Cadastral Subcommittee task force on the Evaluation of the Cadastral NSDI.

Tasks 7: Document the best practices and methods for parcel data distribution.

Responsibility: USGS National Map, National States Geographic Information Council (NSGIC), and the FGDC Cadastral Subcommittee.

As previously mentioned there are over 4,400 entities that are responsible for collecting and managing parcel data at the county and municipal levels of government. The creation of regional parcel databases requires that an infrastructure is in place that can efficiently compile this data into regional or statewide data coverage. Current methods of access and distribution by the states include three principle approaches.

Compilation of independent databases: Counties manage the collection of their data locally adhering to guidelines provided by the state. Data is provided to a central collection agency according to standards promulgated by the coordinating agency. Typically the data is provided to the state revenue agency for reporting purposes of property assessment.

Centrally managed databases: A few states have centralized data creation, distribution and access systems, such as Montana and Tennessee. Data is compiled and managed at the state agency and then redistributed to the local units where it is used in locally managed applications and may be supplemented with locally generated information. The Montana service uses a centrally maintained database to provide information back to counties and citizens. A more detailed description of the Montana method is available at Cadastral Subcommittee's Web site (http://www.nationalcad.org). Details about Tennessee's base mapping program can be found at http://gis.state.tn.us/mapping.html

Distributed databases: The National Map / NC OneMap Project (http://www.nconemap.net) has developed a data access and service engine that provides information at various resolutions depending upon the scale of view. This technology was reviewed at the workshop and the potential for this type of service is just beginning to be explored. The National Map / NC OneMap Project utilizes the existing infrastructure and institutional arrangements of local governments demonstrating the ability to seamlessly serve data without having to re-host it in a central repository. It has the ability to provide remote back up for the local sites.

The compilation of parcel data at the state level must be accomplished as a part of normal business operations. Developing a set of best practices for integrating data will provide guidance for those states that do not have methods in place.

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¹⁰Stage, An Assessment of Parcel Data in the United States

CONCLUSIONS

This workshop and subsequent analysis demonstrated that parcel information acquired to meet local government business requirements are overall the most current and accurate data available for emergency response operations. The concept of vertical integration of data, "create locally and use regionally," is a major objective of the National Spatial Data Infrastructure. An opportunity is at hand to realize this objective with parcel data. The technology is no longer the problem; recent pilot projects have demonstrated the feasibility of creating regional and statewide parcel databases. The issue is how to get started. A strategic initiative such as the National Digital Orthophotography Program (NDOP) is a useful model for implementing a conversion program to encourage digital parcel database development. NDOP was developed in the 1990's because of the strong need for imagery at both the national and local level of governments. Funding was sought by the USGS, approved by Congress, joint funding projects were developed, and today there is a national coverage of one meter orthoimagery that is widely used in every state. Digital parcel data is another data source that has equal if not greater potential because it provides intelligence to the landscape needed in emergency response situations. The difficulty with initiating and funding a parcel data program is that unlike orthoimagery, parcel data has never been used at the national level due to the inaccessibility of this large dataset. Simply put there is little experience at the national level with the benefits and use with this type of data. However, most technology hurdles have now been overcome, and having access to a nationwide parcel layer is no longer unimaginable. Parcel data has recently become a commodity as local governments have built their own parcel databases to address their daily business needs and technology has reached a point that applications can be easily developed to meet many "down stream" user needs.

The findings and recommendations from the Hurricane Isabel Parcel Workshop provide a direction for developing the strategies that need to be implemented to make an integrated national cadastral data infrastructure a reality.

Appendix A Cross Impact Assessment

The Cross Impact Matrix (p 12) is an assessment of the importance of parcel data to emergency responders during a disaster. The information was based on the Hurricane Isabel Workshop participants (Appendix B) experience with Hurricane Isabel and other emergency response situations. The attendees provided information about specific events and the utility that digital parcel data provides to addressing the information needs in those events. Two methods were used to rank the digital parcel data: (1) Overall Importance, and (2) Categorical Importance.

Overall Importance: An indicator of the *unique* importance of digital parcel data to resolve the issues described in the event. Three levels of importance were assigned: high, medium, and low:

- High local government digital parcel data is the only source of information that can address the issues identified in the event.
- Medium parcel data adds value but there are alternative sources of data that can address the issues.
- Low digital parcel data can address the issue but it does not add substantial value to other data sources.

Overall Importance accounts for the presence or absence of alternative data sources that can provide the information needed to address the issues. An example is provided by the medium ranking of *Hazardous Materials*, which reflects the knowledge that there are programs that inventory Hazardous Material sites and make that information available to FEMA on a regular basis. This contrasts with the high ranking for *Disaster*

Area Declaration where the only source for information about specific property values comes from the local government parcel database.

Categorical Importance: An assessment by category of how parcel data was used to react to specific events. The principle issues and problems of each event were compiled and a set of nine categories (Table 4) were identified. Each event was then assessed across each of the categories and the cell value indicates the importance that digital parcel data played in addressing the issues of that event. Scores ranged from critical to not applicable.

The following describes the components of the Cross Impact Matrix. There are five sets of columns: *Phases, Event Names, Importance, Issues and Needs, and Counts and Totals*. (Table 1)

- **1. Phases** (Table 2) order of occurrence.
- 2. Importance or Value: Parcel data was assessed on its overall importance in meeting the needs of the event described. If an alternative data sources that could address the same needs as or more efficiently as a parcel database it was deemed to be of lesser importance (Table 3).
- **3. Issues and Needs**: Categories of the types of problems that the workshop attendees identified (Table 4).
- **4. Events** (Table 5): These are associated with phases.
- **5. Counts and Totals:** *Counts* of the number of relevant issues that were addressed, *Totals* of its overall value, and *Average* score. This allows us to provide a basis of comparison for overall worth.

The importance of parcel data to each category of *Issues and Needs* was assessed by comparing the total number of issues for which parcel data was important, the number of events for which it was critical, and the average value. A brief assessment was given as to what these numbers imply. The values in parenthesis are taken from the last three rows in the table (*Total count across 32 events, total count of critical issues, average value*)

The ability of parcel data to address Navigation and Location (20, 4, 2.5) needs occurred across 20 of 32 issues, more than twice the amount of any other issue. It was of high importance in situations where there was a need to navigate to a specific parcel, this was particularly critical when normal routing was altered or there were significant alternations in the landscape (missing signage). Here navigation by coordinates and GPS was possible because accurate locations could be extracted from the cadastral database. The knowledge that the coordinates are derived from highly accurate data provides confidence in the extracted coordinates. Although parcel data addressed issues in most events, its overall value was not high (2.5) because there are alternative addressing techniques that may not be as accurate but are still functional.

Preparation Time (9, 7, 3.7) was assessed as being the most critical issue for providing access to digital parcel data. *Preparation time* indicates that if parcel data is to be made available it can not be done at the last minute. In addition to the process of converting data from maps to a digital format, *production data* must be processed into a *publication format*, and the users need to be ready to receive the data to make full use of it.

Improving Response Time (9, 6, 3.6) was improved cosiderably if parcel data was at the responders "fingertips." Greatest time savings were accomplished by providing "desk-top visits"

that reduced the need for multiple trips to sites and by getting the necessary information to relief organizations faster, which moved all tasks through the queue faster.

Characterization (9, 3, 3.1) was addressed in as many events as *Preparation* and *Improving Response*Time but it was not as critical as the previous items. Characterization is the ability of a parcel database to provide intelligence to the area under evaluation. Combining this with other data sources provides a richness and detail to the data that has great value. Characterizations are crucial in determining economic impact to acquire federal aide and emergency loans.

Spatial Accuracy (6, 3, 3.5) of parcel databases are built to a horizontal accuracy of 6 to 10 ft to meet the business requirements of local governments. This provides the most accurate spatial data source available. These are invariably error checked against large-scale digital orthoimagery (1 ft horizontal accuracy), which provides a another dimension of utility to this data.

Siting of Locations (6, 0, 2.5) was of high importance for debris removal and other events where it was necessary to link a location to an owner.

Economic Impact (5, 4, 3.8): When economic issues were at stake cadastral databases were critical. There were two areas of impact: First at the macro level the determination of overall damage assessment to request emergency relief funds; second at the micro level was to avoid costly errors by having the necessary information to make informed tactical decisions, and using parcel data to expedite funding relief.

Health and Safety (5, 1, 2.8) did not appear to be in critical need of the details of a parcel database except in cases where other data sources were

completely absent. This was the case in *Water* Release, Power Outages during ice storms, and Insect Control when there was a need to find the spatial locations of specific parcels. Of course these situations further demonstrate that if preparation had not taken place these issues could not have been addressed.

Completeness (4, 1, 3.0) of the databases that are maintained by the local property appraiser to meet their daily business operations are incomparable. These databases provided the most current and complete enumeration of property

and structures available.

Computer Modeling (3, 1, 3.3) for emergency situations is mostly within FEMA. They do have data sources for their models but they are estimates of an area derived from the US Census Bureau data. Having more detailed information about each parcel should improve the accuracy of the models. The data requirements of FEMA models needs further analysis. Combining parcel data with other data sets such as elevation data can be viewed as a form of modeling but of a simpler form.

Cross Impact Assessment of the Value of Parcel Data in an Emergency Response Situation

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All Phases	Location Integration	High			4	Ü	3						9	10	3.3	
	Communication Protocols	High		3		4							2	7	3.5	
	Identifying People at Risk	Medium	2										1	2	2.0	
	News Media Communication	Low		2									1	2	2.0	
Pre-Event	Hazardous material sites	Medium	4	4						2			3	10	3.3	
	Re-Entry Permits	Medium	2		3	2					3		4	10	2.5	
	Elevation Mapping of Individual Homes						4					4	2	8	4.0	
	Temporary Housing for Displaced Pers	Medium	2					2					2	4	2.0	
	Data Backup and Protection	High				4							1	4	4.0	
	Federal Response Staging Areas	Low			1								1	1	1.0	
Response	Water release to protect dams	High	4	4		4	4			4	4		6	24	4.0	
	Disaster Area Declaration	High			4				4			3	3	11	3.7	
	Debris Removal	Medium	3		3			2				3	4	11	2.8	
	Debris Accumulation Modeling	Medium			3		3						2	6	3.0	
	Sewer overflow into river	Low	2										1	2	2.0	
	Pre-Print Maps	Medium	2										1	2	2.0	
	Storm Tracking	Low	1										1	1	1.0	
	Mobile homes and facilities at risk	Medium	2										1	2	2.0	
Recovery	Insect Control - Aerial Spraying	High	4			4			4	3			4	15	3.8	
	Care and Feeding of Farm Animals	High	3			4			4				3	11	3.7	
	Aid Requests for affected areas	High	-	3	3				4				3	10	3.3	
	Forest resources and downed trees (in		3	4						2			3	9	3.0	
	Debris Pick Up and Disposal	High		4				3					2	7	3.5	
	Debris Removal Staging Areas	High		4				3					2	7	3.5	
	Navigation in areas of radical feature c		4								3		2	7	3.5	
	Shelter Availability	Medium	2					2			3		2	4	2.0	
	Hot Spot Mapping	High	_		4								1	4	4.0	
	Where is grandma	Medium	2										1	2	2.0	
Mitigation	Mitigation Value Estimates	High	2		3		4				2		4	11	2.8	
Planning	Power Outage	Low	2	4	3	4				3			4	13	3.3	
	Hard Copy Document Protection	High	_			4			3				2	7	3.5	
	Scheduled Debris Pick Up	High	3					3	3				2	6	3.0	
	Evacuation Maps	Low	2				3						2	5	2.5	
Total Count across 32 Events			20	9	9	9	6	6	5	5	4	3			7.6	6.0
Total Count of Critical Issues			4	6	3	7	3	0	4	1	1	1			3.0	3.0
			2.6	3.6	3.1	3.7	3.5	2.5	3.8	2.8	3.0	3.3	2.3	7.1	2.9	3.0
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	Matrix Columns			
Phases	There are five phases to an emergency response situation: Pre-event,			
	Response, Recovery, Mitigation, and Planning.			
Event Names	Participants were asked to describe particular events that occurred			
	during Hurricane Isabel and how parcel data was used or could have			
	been used to address particular events.			
Importance	Participants and staff assessed the importance of parcel data to			
	respond to a specific event. Staff ranked the ability and need of			
	digital parcel core data.			
Issue and	A categorized set of issues or business requirements that were being			
Needs	addressed.			
Totals	Nominal impact score based on the importance and number of issues			
	that parcel data addresses.			
	1. Count: The number of issue categories that were parcel data			
	could address.			
	2. Total: Total of issues importance.			
	3. Average: The average level of importance across the relevant			
	issues			
	4. Median			

 Table 1 Description of the matrix columns

Description of Phases			
Phase	Description		
All Phases	Occurs across all phases		
Pre-Event	Anticipation of the event, this phase only occurs with slow moving events like hurricanes.		
Response	Reaction to the event during and immediately after the event		
Recovery	Post response activities to respond to emergency conditions		
Mitigation	Post recovery activities including planning for future events, and mitigation of damage from an event		
Planning	Not specific to any event based activities, but centers on routine planning, simulations and preparedness.		

 Table 2 Five phases of emergency response.

Values used to Rank the Importance of Parcel Data to an Issue Category					
Value	No.	Description			
High+		Critical, issue can not be addressed by other methods; high economic impact; avoids disastrous consequences.			
High		Extremely high improvement in the accuracy of geography or efficiency of operations. Can not be achieved by other means			
Medium	2	Adds value to other data sources.			
Low	1	Can be accomplished by alternate means			
	0	Not Applicable			

Table 3 The ability of digital parcel data to address a particular need.

Issue Categories and the Number Ranked by the Number of Critical Issues					
Category	Description	Critical Issues			
Requires Preparation Time	The importance of lead time to enable a resource.	7			
Improves Response Time	Improvements in response time have two impacts: 1) frees up resources to address other issues; 2) facilitates ability to respond to a request.	6			
Economic Impact	Averts loss to business and assets; facilitates access to aide.	4			
Navigation & Location	Ties information to geography.	4			
Provides Spatial Accuracy	Improvements in the resolution of geography or completeness of information.	3			
Characterization	Provides information about the structures (improvements) on a property.	3			
Completeness	Updated on a regular and basis.	1			
Health and Safety	Human Health and Safety	1			
Computer Modeling	Valuable to computer modeling.	1			
Siting	Location of suitable parcels to address a particular need.	0			

Table 4 Description of categories for issues and needs arranged by the number of events for which they were critical.

	Description of Events
Event Name	Event Description
Aid Requests for Affected Areas	Data is needed to support landowners and business applications for post event storm relief.
Care and Feeding of Farm Animals	Transporting feed to farms after and event.
Communication Protocols	Local data needs to be included in FEMA protocols in order to make the data readily available during an event.
Data Backup and Protection	All current production and publication data needs to be copied and backed up in a transportable format to protect against possible outage at storm center.
Debris Accumulation Modeling	On-site debris location during and event which includes plotting, classifying and tracking debris.
Debris Pick Up and Disposal	Identify the debris dumping areas so that debris can be collected and disposed of. The different types of debris will require different locations.
Debris Removal	Need to know the locations of blocked roads and what is needed to clear them.
Debris Removal Staging Areas	Identification of parcels that can be use for debris removal.
Disaster Area Declaration	Federal and State declarations of a national disaster.
Elevation Mapping of Individual Homes	Just prior to the event there were a lot of requests from individual homeowners asking what the elevation of their home was so they could prepare for the storm properly.
Evacuation Maps	Design and evacuation maps that can be provided in advance of the storm and widely publicized.
Federal Response Staging Areas	Locating and assembling generators, tarps, people, water, portable toilets, and other equipment.
Forest Resources and Downed Trees (in streams)	Recovery of forest resources after a storm.
Hard Copy Document Protection	This is the protection of the hard copy records like deeds and maps and other records.
Hazardous Material Sites	Location of hazardous material sites so that these areas can be monitored during the event for potential response.
Hot Spot Mapping	These are areas of repeated damage over multiple events.
Identifying People at Risk	A pre-event estimation of where people at risk are located and what their evacuation and service needs may be.
Insect Control - Aerial Spraying	Spraying for mosquitoes and other insects to prevent disease and other problems.
Location Integration	The integration of the various point positions with the same coordinate system and datum, as well as the vertical integration of various data sets.
Mitigation Value Estimates	This is an ongoing process to have the potential values of

	Description of Events
Event Name	Event Description
	affected areas estimated prior to an event.
Mobile homes and facilities at risk	Identify areas that will most likely be at risk in the path of the storm.
Navigation in Areas of Radical Feature Changes	Responders or claims adjusters that go into areas where land marks have been radically altered or destroyed can spend a lot of time simply determining if they are at the correct locations.
News Media Communication	The management of the information for the news media, timing, and providing them enough information to be useful.
Notification of Available Data	The counties are not getting prompt notification that federal and state agencies have information that they can use.
Power Outage	Tracking power outage during hurricane Isabel was highly important to return the community to normal but it is critical in ice storms when the cold can be a life threatening to the disabled.
Pre-Print Maps	Because the hurricane is slow in coming, there is time to pre- print maps for the response and recovery crews.
Re-Entry Permits	The re-entry permits are generated by the county every two years prior to the hurricane season based on mailings to landowners.
Road closures and bridge outages	Identify where roads are still open, where roads are blocked and the reasons for the blockage.
Scheduled Debris Pick Up	Schedule for collecting different types of debris from residents and businesses.
Sewer Overflow into River	Identify areas or instances where sewers or septic tanks have overflowed into rivers and created contamination zones.
Shelter Availability	Identification of where the shelters are located, their capacity, services and how to get to them.
Storm Tracking	Tracking the path of the storm and the predicted landfall in its path.
Temporary Housing for Displaced Persons	People are displaced by the storm for temporary housing.
Water Release to Protect dams	Falls dam on the Neuse river had a water release after a hurricane to save the dam and create capacity for additional run-off.
Where is Grandma?	Non-emergency calls from people outside the area looking for family that are known to be in the storm but are not responding to telephone calls.

 Table 5 Description of events

Appendix B Workshop Attendees

Names	Organization
Anderson, Dennis	North Carolina Department of Transportation
Averett, Steve	Gaston County
Ball, Greg	Dare County
Brown, Jeffrey	North Carolina Center for Geographic Information & Analysis
Friddle, Charles	Wake County
Giordano, David	North Carolina Center for Geographic Information & Analysis
Gray, Tommy	Dare County
Heavner, Jay	Gaston County
Herlong, David	North Carolina Center for Emergency Management
Holloway, Don	Gaston County, GIS Consultant
Humphrey, Wayland	Lenoir County
Kannan, Chris	United States Geological Survey
Kimmel, Stacey E.	North Carolina Center for Geographic Information & Analysis
Lawson, David	Federal Emergency Management Adminstration (FEMA)
Lowe, Janet	Buncombe County
Madding, Dan	North Carolina Department of Agriculture
Minneman, Rex	North Carolina Land Records Management Program
Nagy, Zsolt	North Carolina Center for Geographic Information & Analysis
Oporto, Frank	Federal Emergency Management Adminstration (FEMA)
Payne, Anne	Wake County
Pike, Patricia	Onslow County
Smith, Mark	North Carolina Emergency Management, Mitigation
Stage, David	Cadastral Subcommitte, Eastern Cadastral Coordinator
Stamper, Julie	Pasquotank County
Thompson, Gary	North Carolina Geodetic Survey
von Meyer, Nancy	Cadastral Subcommittee, Secretary
Wray, David	North Carolina Department of Agriculture
Wray, Sarah	North Carolina Floodplain Mapping Program

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